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Tax revenue mobilisation in Ethiopia

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Summary

This thesis analyses tax revenue mobilisation in Ethiopia. The main research question motivating the thesis regards the existence of a crowding out effect of foreign aid on domestic public revenue. Throughout the research we are also able to identify other constraints and opportunities for tax revenue mobilisation in Ethiopia, to shed light on broader budget dynamics and to provide firm-level evidence on effective tax rates in the Ethiopian manufacturing sector.

The thesis therefore contributes to the current debate on tax revenue mobilisation in Africa by providing comprehensive evidence from Ethiopia, using longer time series than most other studies in this literature. Moreover it provides a new theoretical framework to analyse the aid-tax relation. In addition it contributes to the very small evidence base on taxation at the firm level in Africa by virtually doubling the literature and by proposing a theoretical framework for further research.

The thesis starts with a qualitative analysis of the Ethiopian fiscal history between 1960 and 2009. This chapter is based on a descriptive analysis of Ethiopian fiscal data, on the study of secondary sources and on in-depth qualitative interviews.

On the basis of this deep understanding of the Ethiopian context, the thesis proceeds by developing a theoretical framework to explain the possible substitution effect between aid and tax. An empirical estimation of the model stemming from the theory shows that aid is positively associated with tax revenues. Other determinants of the tax ratio to GDP are found to be: trade openness, the manufacturing sector, the agricultural sector and governance.

The following chapter takes a broader look at budget dynamics by using the cointegrated VAR methodology. The results confirm the positive relation between aid and tax. In addition we find evidence for the existence of a domestic budget equilibrium and for a positive association between aid and capital expenditure in particular.

Finally the thesis takes a microeconomic look at taxation by analyzing effective tax rates amongst Ethiopian firms. I find that while tax incentives are widely used in Ethiopia, they do not seem to be affected by lobbying or political connections of the firm.

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The process of writing this thesis has been more challenging and exciting than I could expect when I started.

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This thesis would have not been possible without the support of my Ethiopian friends. They did not only help me to get access to data and information, but also to get to know their beautiful country and culture. I am particularly grateful to the Ethiopian Development Research Institute (EDRI) that offered excellent hospitality and support while I was in Addis. The EDRI staff made me feel at home during my fieldwork. A special thanks also goes to everyone who supported my work at the Ministry of Finance and Economic Development, the National Bank of Ethiopia, Addis Ababa University, and Ethiopian Economic Association. This thesis and my experience in Ethiopia have benefited immensely from their generosity. Betam amasegenalen.

During the PhD I had the great opportunity to discuss my research with experts and practitioners in the field. These conversations were truly thought provoking. I am particularly grateful to those who agreed to be formally interviewed and who provided invaluable insight into the topic of my research. In particular I would like to thank the staff who helped me at the Italian Cooperation, the International Monetary Fund, the World Bank, the OECD, the UK Department for International Development and the

European Commission.

The chapters of this thesis were presented at conferences and seminars throughout the years. I received many useful comments on these occasions, which helped me to identify the main weaknesses of my work, to think about possible solutions, and eventually to improve this thesis. I am especially thankful to the faculty of the Department of Economics at Sussex who were always available to offer good advice and help. I am also grateful to the PhD colleagues that offered both technical help and moral support in the challenging times of my PhD. A special thanks goes to Emilija Timmis, my co-author. She proved not only to be a great person to work with but also a fantastic company once the work was finished, usually with a glass of wine as a reward for a long day spent in a London cafe.

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Chapter 1

Introduction

This thesis looks at tax revenue mobilisation in Ethiopia, a central issue in African countries and particularly in those, like Ethiopia, where tax revenue still falls well below the target level of 15% of GDP[1]. The central question motivating the thesis is how foreign aid influences tax revenue mobilisation in Ethiopia and, more specifically, whether a crowding out effect occurs. The thesis not only answers this question using the case of Ethiopia, but also it goes further by looking at other determinants of the ratio of tax revenue to GDP, at broader fiscal dynamics, and at the tax take at the firm level.

1.1 Background

This research originally stems from a personal interest for aid effectiveness, which remains one of the areas of research most central to the policy debate regarding developing countries but yet far from providing clear-cut answers (Arndt et al., 2010; Rajan and Subramanian, 2008; Bourguignon and Sundberg, 2007). One of the reasons for this lack of consistency in empirical results is that the focus has often been on aid's effects on economic growth, although the link between aid and final outcomes is likely to be indirect and thus possibly weak. In the words of Bourguignon and Sundberg (2007), the aid effectiveness debate needs to 'open the black box' and explore the mechanism, or 'causality chain', that leads from aid to improved outcomes.

In this context, the focus on the fiscal effects of aid is a way to identify more direct linkages of foreign assistance to policy. Since aid is increasingly flowing to governments'

[1] Adam and Bevan (2004) mention a consensus around a tax ratio of 15-20% for post-stabilization countries. International Monetary Fund (2005) suggest that a tax ratio of 15% is a reasonable target for most low-income countries.

budgets[2], and decisions on the budget are the core of fiscal policy, a direct link between aid and fiscal outcomes is plausible. Some authors suggested that the analysis of the fiscal effects of aid is indeed a prerequisite for the analysis of its macroeconomic effects more generally (McGillivray and Morrissey, 2000).

One of the potentially adverse fiscal effects of aid is to crowd out tax revenues. The idea of a possible substitution effect between aid and tax revenues was already postulated in 1963 by Kaldor (Kaldor, 1963), who argued that developing countries should and can primarily rely on domestic rather than foreign revenues. "Foreign aid is likely to be fruitful only when it is a complement to domestic effort, not when it is treated as a substitute for it" (Kaldor, 1963). A substitution effect may happen for many reasons, chiefly because aid may be a less politically costly source of revenue than taxation. Therefore the relation between aid and taxation is crucial in the assessment of its effectiveness and I take it as a central theme for this thesis.

However tax revenue mobilisation is not only important in relation to aid. Higher reliance on taxation stimulates governments in developing countries to establish a social contract with their citizens whereby they pay taxes in exchange for a series of services and guarantees from the state (Moore, 1998; Brautigam et al., 2008). When governments tax, they are implicitly being accountable to taxpayers on the way resources are spent, as well as on the effectiveness and equity of such expenditure. This 'internal' accountability (as opposed to 'external' accountability to donors) is the basis for democratic dialogue, state building and institutional development. It also has clear implications in terms of tax compliance. Moreover in presence of high levels of investment, necessary to meet ambitious development goals, tax revenue mobilisation becomes a prerequisite for sustainability. Schools and public infrastructure can be built today, perhaps with foreign resources, but it will be up to the state to ensure teachers' salaries are paid and infrastructure maintained.

In the context of African countries, tax revenue mobilisation should also be a central part of the aid scaling-up scenario (Gupta et al., 2006), since it is the only real candidate as a feasible exit strategy from foreign aid. While aid is still projected to increase, and certainly so in Ethiopia, a scenario of scaled down aid in the long run is possible. Even if such a scenario may only realize relatively far into the future, it is relevant and necessary for African countries to prepare for it by putting in place an effective tax system that

[2]This is certainly the case for general and sector budget support, but also for other programs that are financed by donors through the government's budget. This is the case of Protection of Basic Services in Ethiopia, for example.

ensures enough resources for the state to sustain the development process. This is not to say that aid should stop flowing to Africa. However it must be the final goal of development aid itself to decrease its share to GDP and public expenditure, in favor of an increased role of domestic revenues. This not only would allow sustainability, but also it would encourage ownership, independence of policy making and it would reduce the volatility and unpredictability that are typically associated with foreign aid[3].

Donors have become more and more aware of the importance of tax revenue mobilisation, particularly in the wake of the global financial crisis that has exposed the dangers of aid volatility and the need to ensure effectiveness for the aid that is provided. Donors' support to tax mobilisation has focused both on tax policy, such as the introduction of VAT, and on tax administration issues, such as the establishment of revenue authorities[4].

The increased attention that tax revenue mobilisation has received in recent years is shown, for example, by the African Economic Outlook and the African Development Bank's annual meeting of 2010, both focused on the theme of public resource mobilisation and aid (OECD and African Development Bank Group, 2010); the creation of the African Tax Administration Forum, inspired by the 'International Conference on Taxation, State Building and Capacity Development in Africa' held in South Africa in August 2008; the OECD Global Forum on Transparency and Exchange of Information for Tax Purposes (OECD, 2012); and a recent report by the UK House of Commons on this theme (House of Commons International Development Committee, 2012). On its part, Ethiopia has recognised the importance of tax revenue mobilisation in its new development plan, the Growth and Transformation Plan (GTP). The GTP foresees an increase in tax revenue of about 25% a year in nominal terms, to reach a tax share of GDP of 15% by 2015. Given that Ethiopia's tax share stood at about 11% of GDP at the beginning of the GTP period, this objective is certainly ambitious. The plan also recognizes that the main source of finance for investment and development expenditure in general will have to be domestic rather than external, and increasingly so.

Since aid and taxation are deeply intertwined in developing countries, it is crucial to explore their relation in detail. Therefore the main research question motivating this thesis is whether aid crowds out efforts to mobilise tax revenue in Ethiopia. However other aspects matter for tax revenue mobilisation and they are also explored in this thesis. Specific

[3]See Bulir and Hamann (2008) for evidence on the higher volatility of aid with respect to domestic revenue.

[4]See Fjeldstad (2013) for a review of donors' support to strengthen tax systems in developing countries.

additional research questions are outlined clearly at the beginning of each chapter. These relate for example to the role of tax bases in the economy such as trade openness, the manufacturing sector and agriculture. While trade and manufacturing are usually deemed 'easy' to tax due to high accessibility and visibility, fiscal incentives and exemptions may prevent a full exploitation of these tax bases. Trade and manufacturing are included in the econometric model estimated in chapter 3, and chapter 5 takes a closer look at the microeconomic level in the manufacturing sector. Furthermore taxation in the agricultural sector is particularly problematic in presence of high levels of subsistence. When this variable is included in the model estimated in chapter 3, I find that it is negatively associated in particular with domestic tax revenues.

1.2 Approach

Tax revenue mobilisation is a multifaceted issue that has attracted the attention of both economists and political scientists. While the former group has often focused on the econometric analysis of tax effort and on the mix of tax types, amongst others, the latter has looked at the relation with state building and institutional development. Both aspects, the political and the economic one, are important for policy-oriented research. The econometric analysis can provide 'hard facts' about the role of tax bases and aid or of the determinants of the tax take at the micro level, in our case. The political analysis can explain these results in the country specific context and connect them to important political economy dynamics that are difficult to measure, and therefore to include in a quantitative exercise. So both aspects are relevant and insightful, yet no single method can encompass them in a comprehensive way.

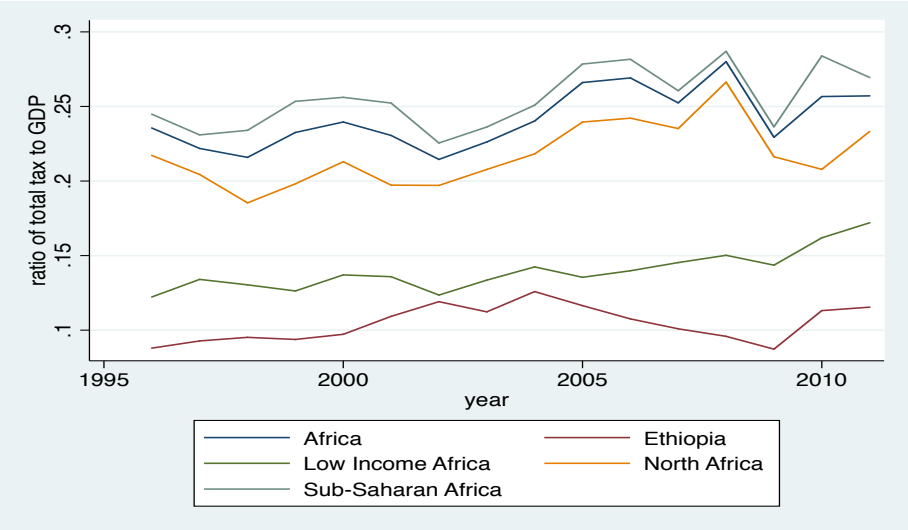
This thesis therefore adopts a mix of analytical tools to study tax revenue mobilisation in Ethiopia, encompassing both quantitative and qualitative methods. This choice is not only grounded on the nature of the topic analyzed, but also on the willingness to keep the analysis policy oriented. Since tax revenue mobilisation is so central to the policy debate on developing countries, this thesis aims at contributing to it as well as to the academic literature. To this aim, I always try to complement econometric results with qualitative information obtained from an in-depth analysis of primary and secondary sources of information, including interviews to policy makers and experts. The bulk of the qualitative analysis is reported at the beginning of the thesis, in chapter 2, to set the stage for the quantitative chapters. However relevant elements from the qualitative analysis are referred to throughout the thesis as appropriate. In particular the qualitative analysis

complements the econometric exercises by informing the design of empirical models and by allowing an interpretation of results that is deeply rooted in the Ethiopian context.

As far as the econometric exercises are concerned, preference is generally given to the simplest econometric methods that are able to yield indications on the research questions motivating each chapter. This approach is also motivated by the policy orientation of this research, that favors results that are easy to interpret and communicate. Moreover the mixed methods approach is applied also within the econometric chapters, that encompass both macroeconomic and microeconomic analysis therefore offering a comprehensive view on tax revenue in Ethiopia.

On the macroeconomic side, chapters 3 and 4 use time series econometrics and particularly cointegration techniques that allow the distinction between short run and long run effects. They use Ethiopian macroeconomic data from the Ministry of Finance and Economic Development from 1960 to 2009. This is a longer time series than most studies of this kind and it therefore allows potentially more robust inference. Moreover the unique history of independence of Ethiopia contributed to the early development of modern fiscal institutions and data collection activities. Partly because of this, Ethiopia today reports the highest Statistical Development Index in Africa, together with South Africa (OECD and African Development Bank Group, 2010). This dataset therefore represents a strength of the analysis, particularly in the African context.

Figure 1.1: Ratio of tax revenue to GDP in Ethiopia and in Africa



Source: author's calculations using data from the African Economic Outlook 2010 and Africa Development Indicators.

On the microeconomic side, chapter 5 brings a microeconomic view to a topic largely debated in the macroeconomic literature. By looking at effective tax rates, i.e. the ratio

of tax payments to income at the firm level, it essentially mirrors at the microeconomic level the tax share (of GDP) that was analyzed previously at the macroeconomic level. The adoption of a case study approach allows the connection of the macroeconomic and microeconomic results in the context of the broader Ethiopian context. Moreover by focusing only on one country this thesis is able to offer a highly comprehensive and in-depth analysis on tax revenue in Ethiopia, that partly overcomes the limits inherent to cross country studies.

1.2.1 Why Ethiopia?

The case study approach motivates the focus of this thesis on Ethiopia, which is a good setting for studying tax revenue mobilisation for a few reasons. First of all the country still has a lower tax share (of GDP) than any grouping of African countries[5], as shown in figure 1.1. In addition it is still highly reliant on trade taxation, more so than other African countries (OECD and African Development Bank Group, 2010). This indicates that the desired shift from trade to domestic taxation (in the context of trade liberalization) has not fully occurred in Ethiopia. Given the level and structure of taxation in Ethiopia, the analysis of tax revenue mobilisation is particularly relevant to this country. Moreover in a context of low domestic revenue, it is all the more important to ensure that aid does not have the adverse effect of crowding out tax.

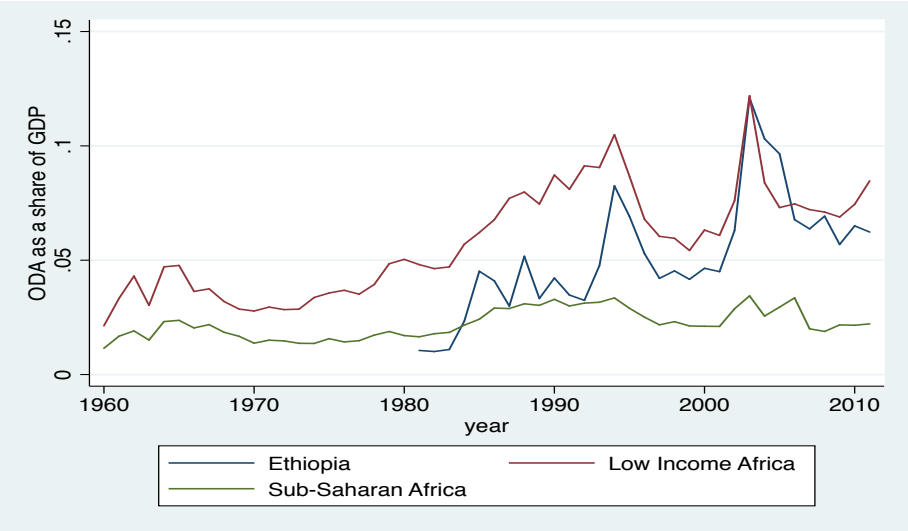
As for aid, Ethiopia is widely considered an 'aid darling' since foreign assistance (official development assistance, ODA, as a share of GDP) has been higher than in other Sub-Saharan African (SSA) countries since the mid 80s (see figure 1.2). Moreover foreign assistance is projected to increase further in the coming years. For example the UK's Department for International Development (DFID) has identified Ethiopia as one of its focus countries in the aid review of 2011, which implies sustained and increased amounts of aid. This focus is grounded on the fact that Ethiopia is 'good value for money'[6], as it ranks in the top 5% of countries with the highest 'need-effectiveness' index (Department for International Development, 2011).

However while Ethiopia today receives more aid as a share of GDP than other SSA countries (figure 1.2), this figure has been lower than other low-income African countries

[5] In figure 1.1, 'Africa' includes all African countries; 'Low Income Africa' includes countries classified as low income by the World Bank; 'North Africa' includes Algeria, Egypt, Lybia, Morocco, Sudan and Tunisia; 'Sub-Saharan Africa' includes all other countries.

[6] Howard Taylor, former head of DFID in Ethiopia, was quoted as saying that the review of UK aid in the world has shown that Ethiopia is 'good value for our money', thus justifying aid increases (Dereje Feyissa, 2011).

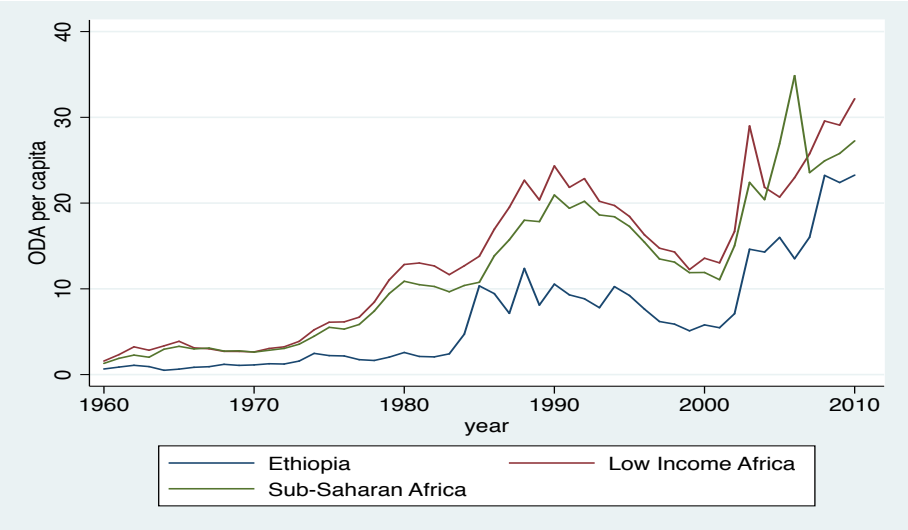
Figure 1.2: ODA as a share of GDP in Ethiopia and in Africa



Source: author's calculations using data from OECD and Africa Development Indicators.

(except for a few years in the early 2000s). Moreover ODA per capita in Ethiopia has always been lower than both the SSA average and the low-income countries average (see figure 1.3). This may be expected in the context of a large country (with about 80 million people it is the second largest population in Sub-Saharan Africa) that however is still one of the poorest in the world[7].

Figure 1.3: ODA per capita in Ethiopia and in Africa



Source: author's calculations using data from OECD and Africa Development Indicators.

Finally Ethiopia is a country with very ambitious development goals. The GTP foresees

[7]Ethiopia ranks 171st out of 184 countries for GDP per capita in purchasing power parity in 2013.

an annual GDP growth of 11% in constant terms during the planning period. This high growth is largely fuelled by high levels of investment, that in turn require large amounts of domestic resources to be financed and sustained. Last but not least, data in Ethiopia is better than in other African countries, therefore allowing more robust econometric results. It therefore seems timely and relevant to study tax revenue mobilisation in the case of Ethiopia.

1.3 Structure and overview

This thesis is structured around four substantive chapters, from 2 to 5, while chapter 6 draws some broad conclusions from them.

The research starts in chapter 2 with a qualitative analysis of aid and taxation in Ethiopia from an historical perspective, covering the period 1960-2009 which is also the one considered in the econometric analysis of chapters 3 and 4. The inclusion of this chapter is motivated by a strong belief that understanding the local context can represent a great value in understanding empirical results and in drawing conclusions that are consistent with the country-specific context. The main contribution of this chapter to the literature is to provide a fiscal history of Ethiopia that was not available before in these terms for the period considered. In addition it contributes to the thesis by setting the stage for the subsequent econometric analysis, that often refers back to this chapter for relevant in depth qualitative elements. The analysis is based on the desk study of a rich set of secondary sources, including published articles and reports but also unpublished documents collected in the field. Moreover the analysis gains additional insight thanks to about 20 in-depth interviews to policy makers and experts[8]. I identify four underlying factors in Ethiopian history that are relevant to tax revenue mobilisation and particularly to its relation with aid. Moreover they are relevant in the design of the econometric models and particularly as regards exogeneity and structural breaks. These factors are: the the long tradition of statehood and continuity; the history of independence from colonial powers; political commitment and ambition in development plans; and the relative costs of taxation and aid.

On the basis of this in-depth analysis of the country context, chapter 3 provides an analysis of the tax share (of GDP) in Ethiopia. These two chapters (2 and 3) are highly complementary, as they both look primarily at the aid-tax relation, with the aim of fully

[8]To these formal interviews are to be added another 20 informal or preliminary interviews.

exploiting the advantages of a case study approach using both quantitative and qualitative methods. The analysis of chapter 3 is based on a tax effort equation estimated using Ethiopian data with an error correction model (ECM). I find that aid has a positive effect on the tax share that is robust to the inclusion of governance, a usual source of omitted variable bias, and to other potential problems such as endogeneity. While the focus is on aid, other tax determinants are included to control for the effects of changes in the main tax bases. Trade and the manufacturing sector are found to have a positive effect on the tax share, that is particularly strong for the latter. The coefficient on agriculture is largely non-significant in the aggregate tax equation, probably due to contrasting positive and negative effects found when running separate regressions respectively for trade and domestic (direct and indirect) taxes.

The following chapter (4) takes a broader look at fiscal dynamics by including expenditure in the analysis. The empirical methodology is the cointegrated VAR (CVAR) model that allows the estimation of a set of simultaneous long run relations as well as rich short run dynamics. The main advantage of adopting a CVAR is its a-theoretical nature, that relies instead of a rich set of tests for model specification. Moreover by estimating simultaneous equations, the CVAR does not require an a priori definition of variables as endogenous or exogenous. The drawback is that this method, by estimating a large number of parameters, is highly demanding on the data and the results are often model-specific. However by using the Ethiopian data, with more observations than normally available in the African context, we are able to obtain results that are robust to different model specifications. Three main results stem from the analysis. Firstly, we find evidence for the existence in Ethiopia of a long run domestic budget equilibrium that does not include aid. Secondly we find a positive relation between aid variables (grants and loans) and expenditure, that is particularly strong between grants and capital expenditure. Last but not least, we confirm the previous result of a positive relation between aid (both grants and loans) and taxation therefore finding no evidence of a substitution effect.

It is useful at this point to underline briefly the differences and complementarities between the single equation (ECM) model estimated in chapter 3 and the CVAR of chapter 4. While the former is more structural, the latter is largely a-theoretical and it allows testing all the assumptions and restrictions that are imposed on the model. Both have advantages and disadvantages. On the one hand, the main disadvantage of single equation models is that they assume the exogeneity of explanatory variables and this assumption is often difficult to test empirically. On the other hand, CVAR is highly reliant on the data

and it may therefore yield fragile results in small samples where only few degrees of freedom are allowed. As far as advantages are concerned, single equation models allow the inclusion of more variables that are potentially relevant other than fiscal ones alone. While the effect of trade, manufacturing and agriculture on tax is less contentious in the literature than that of aid, it is nonetheless valuable to provide evidence on these aspects at the country level. Moreover their inclusion allows considering tax in perspective, by controlling for available tax bases[9]. On the other hand the CVAR allows the exploration of broader fiscal dynamics that include expenditure and potentially deficit, that are excluded from the ECM model, and the behavior of tax revenue in the budget process. Therefore these two approaches, while partly overlapping, offer complementary insights and are therefore both valuable to the purpose of this thesis. The consistency in the results regarding aid and taxation also confirms the robustness of this positive relation.

Chapter 5 takes a microeconomic view on the tax take by looking at effective tax rates (ETRs), broadly defined as tax payments as a ratio of profits at the firm level. The chapter focuses on corporate taxation, that in Ethiopia contributes 17% to total tax revenue and about half of total direct taxes. This is a rather substantial contribution particularly considering that the manufacturing sector, the main but not only contributor of corporate taxation, represents only 5% of GDP in the country. Corporate taxation is therefore already a substantial contributor to total revenues and, perhaps more importantly, it has the potential to contributing even more to the government's budget in the future as the manufacturing sector develops further. The analysis of ETRs contributes to the literature both by introducing a theoretical framework that was not available before, and by providing evidence on taxation at the firm level in Africa that is largely under-represented in this literature. I find that tax incentives are very generous in Ethiopia, with most firms paying ETRs that are well below the statutory tax rate. However the ETR does not seem to be affected by lobbying or political connections. On the contrary, size and public ownership are associated with higher effective tax rates in Ethiopia.

Finally chapter 6 provides an overview of the conclusions of this thesis, drawing on the more detailed discussion presented at the end of each chapter both in the conclusion sections and in the interpretation/summary of results sections.

[9]This is also reinforced by the use of the tax ratio to GDP as a dependent variable rather than the log of the deflated value of tax revenue as in the CVAR.

Chapter 2

A fiscal history of Ethiopia: aid dependence and taxation 1960-2009

2.1 Introduction

Tax revenue mobilisation in Africa is attracting increasing attention due to its central role in financing development plans, in alleviating aid dependence and in establishing a social contract between the government and citizens (OECD and African Development Bank Group, 2010; Brautigam et al., 2008; OECD, 2008). This topic has been studied by academics from different disciplines, as it is multifaceted in nature, and particularly by economists and political scientists. This chapter aims at bridging those two complementary areas of research by providing an in depth qualitative analysis of taxation and aid in Ethiopia in the context of the economic analysis presented in the other chapters of this thesis.

The qualitative analysis sheds light on the political economy of fiscal policy and aid in Ethiopia between 1960 and 2009, a period for which detailed fiscal data is available. The main focus is on exploring the existence of a substitution effect between aid and tax, whereby large inflows of aid may discourage the government's efforts towards tax revenue mobilisation. While going through the Ethiopian fiscal history, the elements that drive fiscal dynamics are underlined and explained in the specific political and cultural context of Ethiopia.

The bulk of this chapter (sections 2.3, 2.4 and 2.5) provides a review of Ethiopian fiscal history that, to the best of my knowledge, is not available in such comprehensive

terms for the period considered. This part is based on secondary sources as well as on the documents and data collected during 18 months of fieldwork between 2009 and 2012. In addition in-depth interviews were carried out during the fieldwork, adding primary information to the historical account (see section 2.2 for more details on the methodology). The interviews cover particularly the most recent history of which more interviewees have direct experience.

The historical review and the insights obtained during the interviews allow the identification of four inter-related underlying factors in Ethiopian history that influence the aid-tax relation, as well as fiscal policy more generally (see section 2.6). The analysis finds no evidence of a substitution effect between tax and aid and it shows that the existence of such an effect would be particularly ill-grounded in the Ethiopian context.

This chapter therefore contributes to the literature in three ways. Firstly it provides a review of the Ethiopian fiscal history that was only available in separate documents, sometimes of difficult access, and not in a comprehensive single research. Secondly it provides an in-depth original analysis of the aid-tax relation in Ethiopia, supported by historical facts an by insights obtained in the interviews. Finally, it provides a bridge between political and economic analysis by underlining elements that are useful to carry out a meaningful econometric exercise. In particular it helps in defining the theoretial structure and the restrictions that often have to be applied in macroeconomic models. This is important in the context of relatively short time series, where the confirmation of econometric results by a solid qualitative analysis can help validating them. In addition it allows the interpretation of the results in a way that is realistic and consitent with the country context, which allows providing more solid conclusions and policy recommendations.

Research questions

Based on this background, this chapter aims at answering the following research quesitons:

- What has been historically the relation between tax and aid? Is a substitution effect occurring in Ethiopia?
- How does this historical background influence that relation today?
- What have been the main drivers and constraints to tax revenue mobilisation between 1960 and 2009?

2.2 Methodology

The analysis is largely based on a long period of fieldwork carried out during 18 months spent in Addis Ababa between 2009 and 2012[1]. During this time I worked closely with government officials and functionnaires with a long experience of macroeconomic analysis to put together my dataset. I also conducted numerous discussions and formal interviews with relevant actors.

The fieldwork covered the following three phases. First, necessary information and data was collected and organized in a consistent format. This process involved many meetings and discussions that allowed me to obtain a first understading of fiscal policy and aid in Ethiopia as well as to establish relations with a number of relevant actors, many of which would be future interviewees. Secondly, the fiscal data was used to carry out a preliminary descriptive and econometric analysis and the other information was reviewed and organized. On the basis of this preliminary analysis I prepared the interview guide for the formal interviews, also including the issues emerging from meetings and discussions. The timing of the formal interviews after the initial qualitative and quantitative analysis was completed allowed a more specific focus on the results and on their interpretation. Finally, the interviews were carried out and the information collected was organized and analysed. This last step is supported by an in depth review of the literature on the economic history of Ethiopia and of other relevant documents, reports and tax laws collected in the field. The study of these documents was largely carried out in preparation of the interviews but it was systematically elaborated in the last stage of the process.

As far as the formal interviews are concerned, the choosen format is that of in-depth or un-structured interviews. These in practice take the form of a conversation that pursues a precise purpose (Ritchie and Lewis, 2003). This "conversation" is based on an interview guide that allows the researcher to be flexible in terms of the order of the questions and topics, which is mostly driven by the issues brought up by the interviewee and by the natural flow of the conversation. All questions are asked as open questions, thus avoiding any type of suggestion of possible answers. An initial general question is usually followed by related and more detailed follow-up ones. Assumptions and hypotheses are formulated as questions to assess their acceptability before proceeding further. On certain occasions interviewees were asked about specific results obtained in the quantitative exercise and

[1]Most of the field research was carried out while I was affiliated as Resident Researcher to the Ethiopian Development Research Institute (EDRI), a local research institute to which I am deeply grateful for their continued support throughout my research.

their possible interpretation. The interviews normally lasted for 45 minutes, net of the initial introductions (where necessary) and explanation of the process.

The broad themes included in the interview guide are the following.

- **Fiscal policy and reform, with a particular focus on taxation**. This section includes in particular questions on the sustainability of fiscal policy, revenue targets, tax composition, the objectives of tax policy and reform, and the constraints to tax revenue mobilisation.

- **The characteristics of aid in Ethiopia and the relation with donors**. This includes the following sub-themes: the type and quality of the relation with donors, conditionality and influence in policy making, predictability and reliability, the determinants of variations in aid flows, aid modalities incuding in particular grants and loans.

- **The relation between domestic revenue mobilisation and aid**. This section was mostly focussed on the interviewee's perception of this relation and on the possible channels that would explain it, including in particular: capacity building, technical assistance, the effect of aid on the tax base, and trade liberalization.

To these three main themes are to be added questions that explore more specifically the historical perspective on these topics. These questions were asked only to people who have an academic background in history, to those who have a long experience in the country and to those who have been working in relevant government institutions for long periods of time in the years considered. Clearly these categories are often overlapping.

As far as interviewees are concerned, they belong to three categories: government officials, donor agencies and international organizations, and independent experts. The boundary between these categories is often blurry as it is fairly common for government employees to join international organizations at a certain stage of their career. This adds an interesting element to interviews as these persons have a good understanding of both the government and the donors' perspective. In addition I had the great opportunity to interview a few persons who have been involved in macroeconomic policy, and particularly fiscal policy, for as long as three decades as well as foreigners whose experience in Ethiopia dates back as far as the early 60s.

The institutions involved in the interview process were, amongst others, the Ministry of Finance and Economic Development (MOFED), the National Bank of Ethiopia (NBE), the World Bank, the International Monetary Fund, the European Commission and DFID,

as well as experts from Addis Ababa University, the Ethiopian Economics Association and the Ethiopian Developent Research Institute, or independent experts. The most senior relevant person was interviewed in most cases, typically at the director or head of division level, as well as officials of lower seniority when they had a specific expertise on the topic.

I finally ran 19 formal interviews for which I have records. To these are to be addeed over 20 informal or preliminary interviews carried out throughout the period and for which written records have been kept. It is important to note that although all formal interviews are recorded, such records as well as the names of the interviewees will not be disclosed. Therefore any reference to interviews in this chapter is made in a way that makes it very difficult to trace the identity of the interviewee[2].

Although no systematic attempt was made to validate responses, two methods were used to partially cross-validate the results from the interviews and thus to make sure they correspond to reality. First, the same questions were typically asked to more than one person within the same institution, and across institutions. While differences in perception across institutions may be expected, within the same institution answers should be largely in line. This was indeed the case, and the main themes emerging from the analysis were also lagely shared across institutions. Secondly, after receiving an answer to one of the overall questions, follow up questions were asked to gain additional insight but also to test whether the answer had a solid and consistent basis. In addition, where possible, any information obtained in the interviews was cross validated with available documents, reports, and published material.

The main reference period is 1960 - 2009 which is also the temporal frame of the broader economic research, including the econometric analysis. However this chapter also briefly discusses events before and after these years when they provide relevant elements for understanding tax revenue mobilisation and aid in Ethiopia.

Interviews are at the core of the analysis particularly for the last period of Ethiopian history (section 2.5). For earlier years (sections 2.3 and 2.4) the analysis is based mainly on an elaboration of secondary sources that are cited throughout. However original elements from interviews are included also in sections 2.3 and 2.4 and particularly they were useful in allowing a consistent reading of the history along the theme of this research.

[2]For more details on institutions that took part in interviews see appendix 2.B.

2.3 The Imperial period: 1941 - 1974

The imperial history of Ethiopia dates back several centuries and although there are interesting fiscal aspects to it, here we only focus on the period following the Italian invasion of 1935 - 41 and until the 1974 revolution that led to the overthrow of the Emperor. When the Italians invaded Ethiopia in 1935 Haile Selassie had already been in power for a few years and he left the country as a result. It was only in 1941 that he came back to Ethiopia and the empire was re-established, together with many of the institutions and laws that have shaped fiscal policy for over three decades. However it is important to note that fiscal policy was already perceived as an important issue before the Italian invasion, and the 1931 Constitution stated that:

> "The receipts of the Government Treasury, of whatever nature they may be, shall be expended in conformity with the annual budget fixing the sums placed at the disposal of each Ministry."

This quote shows that the concept of budget as an instrument to connect revenues and expenditures was already present before the invasion, although it was formally implemented only in the early 40s. This section is mainly based on secondary sources referenced throughout, unless otherwise stated.

2.3.1 Taxation in the agricultural sector

The agricultural sector during the Imperial period was particularly important not only for its contribution to the economy but also because land was the basis of power. The traditional system of land tenure in Ethiopia is essentially based on the concepts of *gult* and *rist*. The former refers to the land assigned to landlords who had the task of administering it and who could extract tributes (*gebbar*) from tenants. The latter refers to the actual ownership of the land, that was given to peasants/tenants on the condition that they would fulfil their *gebbar* obligations. Under this arrangement *rist* ownership was considered permanent and it was inheritable, although in fact it was still conditional. *Gebbar* was usually paid by offering between one third and one half of the produce, labor services and gifts (Shiferaw Bekele, 1995; Brietzke, 1976). This system created a clear distinction between peasants and landlords, in addition to being often regarded as exploitative.

While this description of the land tenure system is highly simplified, it provides a basis for understanding the structure underlying the tax system. In fact upon the return of the Emperor in 1941 the process of modernization included the substitution of *gebbar*

obligations with taxes payable in cash, introduced with the 1941 Land Tax Proclamation[3]. Generally the modernization process involved the gradual reduction of the administrative powers of landlords and it culminated with the abolition of *gult* in 1966. The process also involved the privatization of land, or "absolutization" of *rist*.

In this context, the revised Land Tax Proclamation of 1944 further exhacerbated the divide between landlords and peasants. By providing for a tax exemption for the original landowner, the law essentially favored absentee landlordism which was rapidly becoming a problem as landlords preferred to move to urban centers and engage in the growing manufacturing and construction sectors. In addition an exemption was provided also for the Ethiopian (Coptic) Christian Church that possessed a large amount of land. This provision not only meant foregoing substantial revenues but also allowing the Church to extract its own tributes from its land.

In addition an income tax was introduced in 1943 including personal incomes, rents and business profits, and providing for exemptions to foster investment. An attempt to introduce a tax on agricultural income was made in 1967 with the Agricultural Income Tax Proclamation. This proclamation was partly intended to address the demands for more equity stemming from the popular movements (see section 2.3.5). The proclamation finally was only a watered down and poorly implemented version of the original intention, due to great opposition from landlords (Shwab, 1970; Brietzke, 1976). Popular protests also expressed opposition to the new law, such as the 1968 tax revolt in Gojjam[4]. Notwithstanding these problems, Eshetu Chole (1984) holds that this tax still fared better than the land tax in terms of revenue generation. Indeed the share of direct taxes in total tax revenue increased from an average of 22% in the five years before 1968 to 30% in the five years after (see figure 2.1).

Generally however direct taxation in agriculture performed poorly both in terms of revenue generation and of equity (Brietzke, 1976; Eshetu Chole, 1984). In addition Brietzke (1976) holds that the traditional tenures remained essentially unaffected by reform. This is certainly true in terms of the exploitation of peasants, particularly in terms of extraction of resources. Landowners were largely shifting the tax burden on to the farmers who instead were experiencing a heavy tax burden for which they saw little in return. In addition

[3]The Land Tax Proclamation provided for tax payments to vary according to the type of land, particularly: fertile, semi-fertile and poor (Shwab, 1970).

[4]The Gojjamis saw the law as a threat to the ancestral right of the people to the land (Clapham, 1988; Brietzke, 1976) and opposed land measurement provisions that would have implied a higher tax burden (Eshetu Chole, 1984; Shwab, 1970).

exemptions and fiscal incentives were benefiting the growing commercial agricultural sector which was also largely reliant on peasant's exploitation (Clapham, 1988). As a result the Imperial Government became increasingly disconnected from the countryside, with little support and only weak links to the political interests there (Clapham, 1988; Shiferaw Bekele, 1995).

2.3.2 Other taxes: trade, consumption and the industrial sector

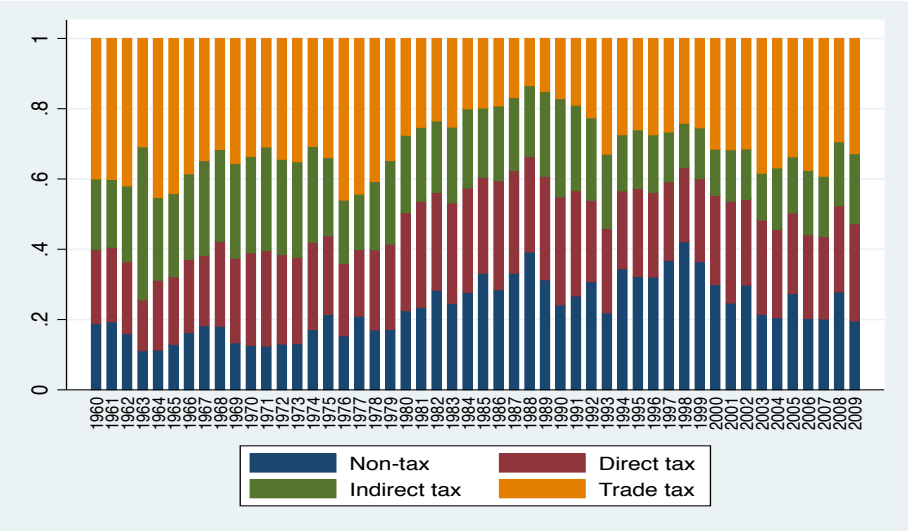
Direct taxation was mainly levied in the traditional sector in rural areas, as the 'modern' industrial sector was still largely underdeveloped. The Italians never really had an industrial plan for Ethiopia and therefore the decade after 1941 was mainly characterized by restoration and reconstruction in this sector. The Imperial government quickly recognised the importance of foreign investment for industrial development and it issued in 1950 the "Notice for the encouragement of foreign capital investment" (Shiferaw Bekele, 1995). In this context a number of fiscal incentives were set for foreign investors and particularly exemptions from business income tax, duty free imports and guarantees regarding the possibility of remitting a proportion of profits. In the following decade Ethiopia experienced accelerated industrialization and a doubling of manufacturing production. This was due not only to fiscal incentives and the government's direct involvement (see development plans in section 2.3.3), but also to the federation with Eritrea in 1952 where industrialization was much more advanced (Shiferaw Bekele, 1995).

Notwithstanding relatively high growth rates, the manufacturing sector in 1964/65 was only contributing 3.1% to GDP (see figure 2.2) and it was mainly in foreign hands. Moreover it was only bringing little benefit in terms of employment. The failure to boost manufacturing has also been linked to the traditional land tenure system that was preventing the creation of domestic savings necessary to finance investment (Shiferaw Bekele, 1995). All this meant that the manufacturing sector was indeed not contributing much to revenue.

As a result of the little tax revenue obtained though direct taxation, the imperial regime was relying more on trade and indirect taxes. The high reliance on trade taxes appears rather clearly in figure 2.1 that plots the shares of revenue types of total revenue. This is also confirmed by a higher share of this type of tax on total revenue under the Emperor than during other regimes (see table 2.1).

Trade taxation was based on the 1943 Customs and Export Duties Proclamation. Import duties were the most important source of revenue, contributing 78% of trade taxes

Figure 2.1: Composition of domestic revenue



Note: Variables are calculated as a share of total revenue. Source: author's calculations using data from the Ministry of Finance and Economic Development

on average between 1949 and 1974. This is consistent with the main industrial strategy of the time, based on import substitution and naturally reflected in high tariffs on imports (Shiferaw Bekele, 1995). However the revenue generating potential of import duties was not fully exploited because of the increase in exemptions aimed at promoting industrial development (Eshetu Chole, 1984). Export taxes were levied mainly on coffee and this introduced an element of instability due to volatility of prices in the international coffee market.

Domestic indirect taxation aimed at generating revenue and at protecting the domestic economy by granting lower rates for domestic products. Revenue was generated with taxes on alcohol, salt, fuel, tobacco and other excises on mass consumption goods, such as sugar and textiles, with large revenue-generating capacity (Shwab, 1970; Eshetu Chole, 1984). The most important source of indirect tax revenue however were transaction taxes, introduced in 1951 and combined with a turnover tax and a tax on construction works in 1963 (Shwab, 1970; Eshetu Chole, 1984). Finally, a stamp duty was introduced in 1957 but it did not generate much revenue.

2.3.3 Increasing revenue needs and development planning

The modernization of the fiscal system was indeed a priority for the Emperor, as proved by the number of laws and reforms implemented in the early 40s. Eshetu Chole (1984) holds that the system in place four years after the return of the Emperor was essentially the same as the one that could be observed in the 70s, although clearly there were changes

and innovations in the meantime. The effort in tax revenue mobilisation, though with many difficulties, was sustained during the Imperial period and it was mainly driven by two elements: the expansion of the state and increased development expenditure. The first element entailed the great increase in the military and in the civilian bureaucracy that were both receiving salaries in cash, besides other benefits (Shiferaw Bekele, 1995). A strong professional army was particularly needed in the context of tensions with insurgents in the newly annexed Eritrea (federation happened in 1952) and a border dispute with Somalia that escalated to an armed conflict in 1964.

The second element pushing the increase of revenues was increased development expenditure, which in turn contributes also to explain the need for an expanded bureaucracy. Development planning became a central issue in the international debate in the 50s and Ethiopia, as a founding member of the UN, was well part of it. The country started working on sectoral programmes already in 1945 with the 10-years industrial development programme developed with the support of the US Development Assistance Mission (Shiferaw Bekele, 1995).

These programs paved the way for the three 5-year development plans prepared under the Imperial regime and particularly referring to the periods 1958-62, 1963-67 and 1968-1973[5]. The planning process and implementation improved over the years, also thanks to the high involvement of foreign advisors throughout all the plans (Shiferaw Bekele, 1995). Foreign resources were also largely used to finance all three plans and Shiferaw Bekele (1995) reports that the first one was financed by a third by foreign resources. Note that these figures are not comparable with the grants data we use because it is not clear what proportion of the financing of the plans was going through the Treasury.

The plans were a great step forward as they were setting clear goals and economic objectives. However their implementation experienced several difficulties and some observers thought the government's commitment to development was purely cosmetic, giving only an appearance of progress (Levine, 1961). Notwithstanding these difficulties and doubts, some effort was made to give a clearer direction in development. This includes at least awareness on the importance of domestic revenue mobilisation, as shown by the following quotes from the Third Five Year Development Plan (1968-1973) .

> "The plan calls for a growth of total tax revenue by almost 15% per year on average, or about 1.4 times faster than the growth of monetary production and

[5]The fourth development plan, starting from 1974, was never implemented for obvious reasons.

income."

> "A central concern of the plan is the effective mobilisation of adequate financial resources. [...] This means in particular an emphasis on general Government and public sector finances to increase effectively the volume of public savings available to provide investment finance."

Finally, an element emerging clearly from the development planning process was the need to improve the quality and quantity of data available in the country. The scaling up efforts in data collection led to the establishment of the Central Statistical Office (CSO) in 1961. The CSO engaged from the very beginning on more precise estimates of the national accounts as well as on several national surveys to collect demographic and other socio-economic data. The first census survey took place in 1961 in Ethiopian urban centers (Shiferaw Bekele, 1995).

2.3.4 Borrowing and external assistance

The great increase in expenditure needs also raised more interest in borrowing and external assistance as sources of revenue.

Figure 2.4 shows that deficits are registered in each year after the mid-60s, when the government started making more systematic use of domestic borrowing to finance its budget (Shiferaw Bekele, 1995). However deficit was still much smaller in magnitude than in later regimes (see average deficit figures by regime in table 2.1). By the early 60s Ethiopia was also rather independent in terms of economic policy in general, having adopted its own currency in the mid-50s and officially established its central bank (National Bank of Ethiopia) in 1963.

As far as external relations are concerned, there is little doubt that Ethiopia stands as a special case in Africa due to its independence from colonial powers. While this ensured a high degree of autonomy, it also meant that Ethiopia in the post-colonial period did not have a 'patron' that would provide aid and lobby for her in the international arena. However Haile Selassie benefited from a high international standing and had strong external relations. Amongst others Ethiopia was a member of the League of Nations since 1923, to which the Emperor appealed personally upon the Italian invasion of 1936; it is one of the founding members of the United Nations; and the Emperor had close ties with the USA that are well documented in Vestal (2011).

Immediately after liberation the most influential country in Ethiopia was certainly Britain. The 1942 Anglo-Ethiopian Agreement was providing for financial assistance but

also for great policy influence, to the extent that some observers likened the country to a British protectorate (Shiferaw Bekele, 1995). This situation was not well received by the Emperor and the agreement was ended in 1944, one year before its expiry, and replaced by a new one where the economic content was much more limited (Shiferaw Bekele, 1995).

The 1942 agreement provided for budget support in the form of grants that however were limited in amount (Eshetu Chole, 1984) and that were soon overshadowed by increased American assistance (Shiferaw Bekele, 1995). Americans established a peer-to-peer relationship with Ethiopia[6] and they actively supported independence from Britain. Americans also provided technical assistance on tax administration and policy, amongst other areas (Bahru Zewde, 2008). In return, the US obtained an ally in the Horn and the Kagnew military telecommunications station in Eritrea that was only closed in 1977 when the Americans fully withdrew from Ethiopia.

Besides the US, Ethiopia could count on bilateral assistance from the Federal Republic of Germany, the Soviet Union, Czechoslovakia and Yugoslavia. Multilateral organizations such as the World Bank (WB), the World Food Program and other UN agencies were also active in the county. UN experts in the 60s and a WB team in 1973 visited the country specifically to give recommendations on the tax system. These focussed on the need to improve progressivity and to reform land taxation, and the WB team in particular underlined the issue of exemptions, *de jure* or *de facto*, for commercial agriculture and landlords (Eshetu Chole, 1984).

Generally however over the period external aid remained always and consistently lower than the Ethiopian requests, although foreign grants and loans together were contributing a fifth of total expenditure on average during the Imperial period (see table 2.1).

2.3.5 Opposition movements and the decline of the regime

A central characteristic of the Imperial style of government, which is indeed also a strong trait of the Ethiopian political culture in general, is related to distrust, secretiveness and suspicion (Levine, 1961; Clapham, 1988; Medhane Tadesse and Young, 2003). Levine (1961) describes this system of mutual spying and constant shuffling of political appointments that was aimed at minimizing organized dissent and at ensuring loyalty to the Emperor. This climate greatly frustrated the growing educated élite that found itself in a purely passive and subordinate role.

[6]This relation was formalized in 1943 with the Mutual Aid Agreement and later confirmed with the Treaty of Amity and Economic Relations of 1951.

Table 2.1: Selected indicators averaged by political era

Indicator	Description	Imperial	Derg	EPRDF
GDP per capita (ETB)		1001.2	995.8	1141.9
GDP growth	growth rate of GDP at constant prices	3.4	1.7	6.5
Agriculture	sector's share of GDP	71.3	59.3	49.9
Manufacturing	sector's share of GDP	3.7	5.5	5.1
Trade openness	(import+export) / GDP	10.5	13.4	29.4
Fiscal pressure on trade	Trade taxes / (export+import)	21.5	23.1	14.8
Tax share	share of GDP	5.3	9.2	9.6
Tax growth	tax revenue growth rate	11.5	8.7	18.5
Grants	share of GDP	1.0	1.8	3.0
Loans	share of GDP	0.7	1.9	2.9
Aid dependency	(loans + grants) / total expenditure	21.1	19.7	28.2
Non-tax revenue	share of GDP	0.9	3.3	3.8
Deficit	share of GDP	0	-2.1	-1.4
Direct tax	share of total tax revenue	25.9	36	34.5
Indirect tax	share of total tax revenue	30.7	29.1	23.6
Trade taxes	share of total tax revenue	43.4	34.9	41.9

Note: Author's calculations using data from MOFED. Constant GDP was used at the denominator of sector shares, trade openness, to calculate GDP growth and GDP per capita. Current GDP was used to calculate shared of tax, loans, grants, and deficit.

The Emperor was indeed troubled by the idea that someone could get enough power to challenge him (Levine, 1961). This fear materialized in a failed military coup d'état in 1960 aiming at establishing a more democratic and progressive government, and at starting economic and political reforms to truly modernize the country. Even if the coup eventually failed, it had great political impact. The Emperor accelerated the reform process, particularly with the Tax Proclamation of 1961, the Investment Decree of 1963, the Investment Proclamation of 1966, the Agriculatural Income Tax Proclamation of 1967, as well as the establishment of the Confederation of Ethiopian Labor Unions (CELU) in 1962.

Notwithstanding these reforms, the underlying tensions were far from resolved. First of all the implementation of the new laws was only half-hearted and the privileges of landlords were largely maintained, including fiscal ones (see section 2.3.1). Tax rebellions in Bale in 1964 and most notably in Gojjam in 1968 (Chege, 1979; Brietzke, 1976; Mengisteab, 1990) are examples of the growing discontent. The land tenure system not only was largely considered exploitative, with a great fiscal burden on the peasantry and growing class inequality (Gilkes, 1975), but also it was seen as an obstacle to agricultural development.

These tensions were further fuelled by economic decline in the 60s and 70s due to the closure of the Suez canal in 1967 and the 1973 oil crisis which contributed to the loss of

competitiveness of Ethiopia as well as increasing prices. Gilkes (1975) estimates that in 1973 prices rose by 20% and that in the first quarter of 1974 alone, the price rise was equivalent to an annual rate of 80%. Finally the famine in 1973 exposed the inadequacy, or the unwillingness, of the Government to reach to rural areas and provide the basic services and food that were desperately needed in the affected areas (Clapham, 1988).

The fall of the Emperor was eventually the result of a series of mutinies, strikes and demonstrations that characterized the last year of the Imperial regime. The masses demanded the sacking of corrupt officials, democracy, pay increments, administrative reforms, the right of association and better working conditions. Last but not least the agrarian question was at the centre of the debate, with the slogan "Land to the Tiller" (Economic and Political Weekly, 1978; Chege, 1979; Gilkes, 1975). However the revolution was largely an urban process and the peasantry remained mostly an inert audience to it (Chege, 1979; Clapham, 1988). Protests culminated in the month-long general strike called by CELU in March 1974 and they did not stop until the Emperor was deposed on 12$^{\text{th}}$ September 1974. By this time the Derg[7], the military junta that would rule Ethiopia until 1991, was largely present in the high ranks of government (Gilkes, 1975; Economic and Political Weekly, 1978).

The details on the revolution that characterized the transition between the Imperial period and the Derg, as well as the main actors involved, are described in section 2.4.1.

2.4 The Derg: 1974 - 1991

The Derg regime took power in 1974 and it was led for most of the period by Mengistu Haile Mariam. It has been divided by some observers (Clapham, 1989; Keller, 1985) in three periods, as follows. The mobilisation period (1974-78) started with the toppling of the old regime and it was characterized by the struggle for power of the different actors involved in the revolution. The regime was at this time mainly concerned with its survival. In the campaign period (1978-1984) the main traits of the regime emerged, such as centralization and collectivization, although state institutions were still at an embryonic state. The plan period (1984-1991) was characterized by the establishment of socialist institutions as well as the scaling up of planning efforts. While this periodization is not strictly followed in

[7]At this time the military junta was not yet known as Derg but as Military Coordinating Committee (MCC). The MCC was established in June 1974 and it essentially translated into the Provisional Military Government (PMG) after the coup in September 1974. The PMG was the predecessor of the Derg and the demarcation line between the two is virtually non-existent.

this section, the events discussed can easily be traced back to it.

2.4.1 The revolution and its opponents

The 1974 revolution that overthrew the Emperor saw two main driving forces: the urban class, represented by CELU and the Ethiopian People's Revolutionary Party (EPRP), and the armed forces. During the revolution the two forces shared a common target: the autocracy and the feudal system. However in 1974 the EPRP was still young and lacked the organization and leadership necessary to be the vanguard of the movement (Chege, 1979; Economic and Political Weekly, 1978). The armed forces took advantage of this vacuum of power and established themselves as the leading force of the revolution.

In 1974 the new military government took power in Ethiopia and it declared itself anti-capitalist, anti-imperialist and anti-Marxist, under a rather general slogan "Ethiopia Tikdem", or "Ethiopia first". Despite its role in leading the revolution, it was clear from the beginning that the Derg lacked a social base as well as legitimization amongst ethinc groups (Economic and Political Weekly, 1978; Chege, 1979; Gilkes, 1975). Indeed the divergence in ideals between the two forces of the revolution became quickly and painfully clear in the aftermath of the revolution.

Both CELU and EPRP, along with students, opposed the military regime since the beginning with massive demonstrations of discontent organized across the country. This dissent was met by the repression of the regime in what is known as 'Red Terror', that caused massive bloodshed between 1975 and 1978. Both CELU and EPRP were neutralized through assassinations and detention. The fomer was eventually replaced with the All-Ethiopia Trade Union that became essentially just a repressive arm of the regime.

The students also paid a high price for their resistence, facing armed repression and group executions throughout the spring of 1977 (Markakis and Ayele, 1977). The *zemecha* program carried out in those years was officially aimed at improving literacy and health in the context of the land reform by displacing students to rural areas. However some observers note that it may have had the hidden goal of avoiding assembly and demonstrations at universities (Gilkes, 1975; Brietzke, 1976).

In addition the Derg was opposed by ethnic minorities that after centuries of Amhara domination were becoming increasingly sensitive. While at the beginning the military regime did not have a clear ethnic connotation, it was perceived to be Amhara dominated and indeed this perception proved true in later years (Chege, 1979; Clapham, 1988; Gilkes, 1982). Naturally the slogan 'Ethiopia First' and the nationalist ideology of the Derg was

not well accepted at the regional level in a country that never really had a national identity (Keller, 1981; Clapham, 1988).

The main threats again were represented by the Eritrean People's Liberation Front (EPLF), that by 1977 had control over most Eritrean towns, and the Somali groups in the Ogaden region. Moreover Tigray People's Liberation Front (TPLF) was created in the years of the revolution and it became increasingly organized during the Derg regime, eventually leading the latter's defeat 16 years later. Ethnic revolts were, again, met with military repression and with only few concessions that largely remained a dead letter (Clapham, 1989).

Finally the Derg was not immune from internal conflict. Internal divisions concerned the response to the Eritrean revolt, the fate of the Emperor, the nature of government, and the violent repression of any opposition to the military government (Economic and Political Weekly, 1978; Chege, 1979; Gilkes, 1975, 1982). Many prominent figures of the Derg were executed and in 1977 Mengistu Haile Mariam eventually emerged as the undisputed leader.

By 1978 most movements of dissent dissolved, having being frightened by the experience of the Red Terror. However the repression was far from settling the movements in the countryside, that continued throughout the period (Clapham, 1988).

Land reform and agricultural sector

To address the problem of the lack of a social base the Derg acted on two fronts. First, it made demagogic claims of carrying out a socialist revolution, aware of the appeal this would have on the masses. Second, it carried out a comprehensive land reform and a program of nationalizations. At the beginning of 1975 all banks, insurance companies, industrial and commercial firms were nationalized. The Land Reform Proclamation of March 1975 made all land the collective property of the Ethiopian people and it redistributed it to the peasants. Hired labor in agriculture and the sale of land plots were prohibited (Ottaway, 1977; Mengisteab, 1990; Cohen et al., 1976). All large commercial farms were nationalized and became state farms, collective farms, or were distributed to the peasantry (Brietzke, 1976; Cohen et al., 1976).

These policies had a highly symbolic value against the background of feudalism. By annuling all previous obligations to landlords, the reform deprived the ruling class of the basis of their power (Brietzke, 1976). The land reform thus paved the way for the consolidation of the Derg's power by increasing its legitimacy amongst peasants and by weakening the opposition (Cohen et al., 1976; Brietzke, 1976). While obligations to landlords were

annuled, taxes to the government were still due. Initially the 1967 Agricultural Income Tax Proclamation remained in effect since that did not depend upon ownership (Brietzke, 1976), but it was later replaced by the Rural Land Fee and Agricultural Activities Income Tax Proclamation in 1976.

The new legislation also provided for the creation of peasants associations (PAs) and urban dwellers associations (*kebele*) throughout the country. Their main role was to implement the land reform and to coordinate the redistribution of land (Ottaway, 1977). More generally they were local administrative units, also in charge of collecting taxes (Ottaway, 1977; Mengisteab, 1990; Cohen et al., 1976; Brietzke, 1976). However capacity was low at the local level and the government committed to reducing illiteracy through the *zemecha* and other campaigns. Indeed illiteracy was reduced from 90% in 1973 to 65% in 1981 (Griffin, 1992).

As the reform was being implemented, three main forms of agricultural production emerged: family farms, cooperatives and state farms. Peasant or family farms remained the most widespread mode of production, occupying over 90% of the cultivated area, and they were organized in peasants associations. Cooperatives started to be more forcefully promoted by the Government after 1978, along with collectivization, but the expected growth in this sub-sector never occurred, neither in terms of quantity nor of productivity. Finally state farms stem from what were commercial farms before the nationalization of 1975 (Griffin, 1992; Keller, 1985; Clapham, 1987). The agricultural development strategy of the government was largely focussed on state farms and cooperatives, despite them being less productive than family farms (Mengisteab, 1990; Clapham, 1987). Consequently they were allocated the lion's share of public resources, including a more favourable tax treatment than family farms (Ottaway, 1977; Mengisteab, 1990).

Manufacturing sector

The manufacturing sector was also involved in the nationalization program, as all large scale industries were put under the control of the Ministry of Industry[8] in 1976 (Wubneh, 1990; Griffin, 1992). Private initiative was generally discouraged, including legal restrictions for capital investments (Griffin, 1992). Since the nationalization program did not provide for any compensation, foreign investment stopped flowing into the country. Any incentive to improve profitability was slashed by top marginal tax rate as high as 89%.

[8]The Ministry of Industry in turn was under the Office of the National Committee for Central Planning (ONCCP).

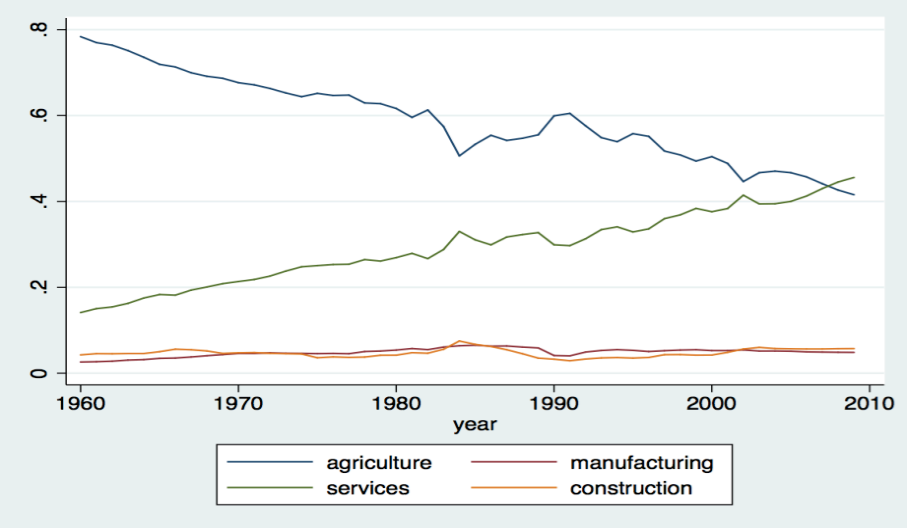
In addition all the after-tax profits of state firms were to be transfered to the government (see section 2.4.3).

Besides government policy, the private sector suffered also because of internal conflicts that led not only to the destruction of some factories in Eritrea and in the East, but also to shortage of raw materials and spare parts, difficulties in transport, the lack of foreign exchange and power shortages (Griffin, 1992).

However Eshetu Chole (2004) holds that the performance of the industrial sector was still more respectable than that of agriculture. This is confirmed by national accounts data that indeed show an average growth rate in the agricultural sector of 1.5% as compared to 3.8% in manufacturing over the Derg period. Despite this better performance manufacturing remained only a marginal contributor to GDP under the Derg, as shown in figure 2.2, although its share was larger than in the Imperial period (see table 2.1).

As a result of bad economic policies, both in the agricultural and in the industrial sectors, GDP per capita was generally lower in the first years of the Derg than at the end of the Imperial rule (see figure 2.5).

Figure 2.2: GDP composition: selected sectors as a share of total



Source: author's calculations using data from the Ministry of Finance and Economic Development

Consolidation and planning

Starting from 1979, with the establishment of the Committee for Organizing the Party of the Workers of Ethiopia (COPWE), the Derg put a systematic effort in building the institutions of a socialist state (Keller, 1985). The whole process however was slow, directed from the top, and it fully reflected existing power structures (Keller, 1985, 1981; Gilkes,

1982).

In 1984 the Workers Party of Ethiopia (WPE) was launched and a new constitution was introduced in 1987, formally establishing the People's Democratic Republic of Ethiopia. Both the constitutional process and the formation of the party were attempts of the Derg to gain political legitimization for the increasingly unpopular military ruling class. However no concessions were made on the demands of opposition groups and thus the process could at best deliver an appearance of representation (Clapham, 1988).

On the planning side, the Office of the National Committee for Central Planning (ONCCP) was part of the new institutional setup and it was aimed at taking the lead on economic development. A decade after the revolution, it launched in 1984 the Derg's first development plan: the Ten Years Development Plan. The timing of its launch was particularly unfortunate, as a major famine broke out in 1984 therefore implying a shift of all national efforts towards the emergency. The famine also accelerated the villagization and resettlement campaigns that were essentially representing the core of development policy before the 10-year plan (Keller, 1985; Clapham, 1987). The weakness of the plan's design and implementation was exposed by a consistent shift of public expenditure away from development and services towards control functions. This is particularly the case of military expenditure that was needed to maintain the Derg's authority (Clapham, 1988; Eshetu Chole, 2004).

As the consolidation process continued and power concentrated increasingly in Mengistu's hands, continuity with the Imperial regime became more clear. In fact the central thesis of Clapham (1988) is that:

> "There *has* been a revolution. Much has changed. But a sense of *what* has changed, and how, is to be gained only through an appreciation of continuity."

This continuity in particular entailed the political culture and style of administration, based on personal relations, suspicion and the lack of independent institutions; nationalism expressed in the slogan "Ethiopia First", that can be compared to Haile Selassie's vision of "Greater Ethiopia" (Keller, 1985); and the cult of personality and centralism in decision making that increasingly developed within the Derg. The strong state and the attitudes towards political authority developed under the Imperial regime were in fact not an obstacle but rather an advantage of the new military government and a determinant of the success of the revolution (Clapham, 1988).

The Derg finally never obtained legitimacy and support from the people. An attempted coup in 1989 and the military losses in Tigray and Eritrea, that by the late 80s were fully

in the rebels' hands (Young, 1997), exposed clearly the weaknesses of the Derg. It was the beginning of the end for the military regime.

2.4.2 External relations and aid

Foreign support to Ethiopia at the time of the 1974 revolution was largely American. However the US failed to protect the Imperial regime against the revolution. On the contrary, it kept cosy relations with the new government notwithstanding its anti-imperialist and socialist proclamations and it even struck a deal with the Derg to ensure the provision of arms, tanks and jet fighters. In the late 70s however the relations with the US cooled because of concerns on human rights violations and the expropriation of American private assets without compensation (Economic and Political Weekly, 1978; Keller, 1985; Clapham, 1988). American aid was eventaully withdrawn in 1979, although US humanitarian assistance kept flowing.

European countries instead remained largely present in Ethiopia, providing no evidence of discrimination due to the Derg's socialist policies (Clapham, 1988). Ethiopia was part of the Lomé Conventions with the European Community since it came into effect in 1975, also benefiting in terms of aid (Clapham, 1988). In terms of trade, Western countries remained Ethiopia's main trading partners (Clapham, 1987; Keller, 1985) while foreign investment decreased sharply.

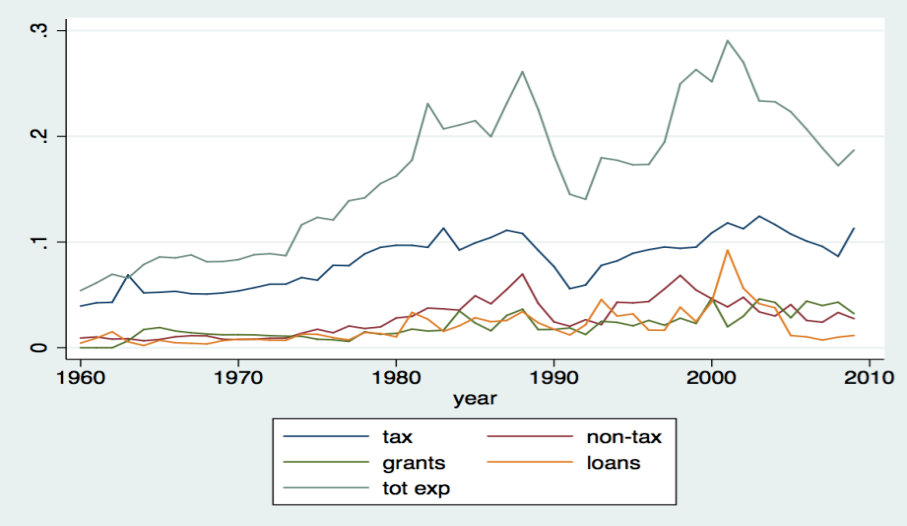
The decrease in American foreign aid was largely compensated by an increase in soviet aid and military assistance (Keller, 1985). The Soviet Union and Cuba provided arms, military training and economic support to the Derg, which was crucial in the fight against the opposition and particularly against ethnic rebellions in Eritrea (1979) and the Ogaden (1978). Indeed the importance of soviet military support pushed the Derg to proclaim its Marxist-Leninist inclination even more forcefully (Chege, 1979; Markakis and Ayele, 1977; Keller, 1981; Clapham, 1988). The interviews confirmed that the USSR was surely the most influential foreign actor during this period, while Western countries had little or no political leverage.

The USSR presence encouraged the switch from developmental to military expenditure that the Derg was pursuing. Moreover it implied a decrease in the quantity and quality of external advice that Ethiopia was receiving, in turn resulting in poorer development strategies. Despite this situation many observers I interviewed agreed that the Derg still had some commitment to development, although it largely failed to achieve much mainly because of conflict and bad policies.

While it may be tempting to consider Ethiopia under the Derg as a rather passive actor in the hands of the USSR, this would be a very poor representation of reality. The Derg had its own view on Ethiopian development which focussed largely on nationalism and it diverged from the Soviet idea of socialism. In the consolidation phase indeed pro-Moscow Derg and WPE members were systematically neutralized to favour nationalist views instead (Keller, 1985). Moreover relations with the USSR were rocky, although strong, as shown by the early ending of two state visits of Russian ambassadors because of tensions with the Ethiopian government (Clapham, 1988). Mengistu was very sensitive to Soviet foreign intervention in domestic affairs, perhaps also because his alliance with Moscow was sometimes perceived as lessening his standing as a national leader (Clapham, 1988).

Towards the end of the Derg period Ethiopia became largely isolated in the international scene. On the soviet side, the fall of the Berlin wall and the rise to power of Gorbachev resulted in a significant reduction of soviet aid to Ethiopia. On the Western side, the increasingly evident weakness of the regime caused Western donors to be more cautious and to give more attention to the rebel movement of Tigray. However their understanding of the political dynamics in Northern Ethiopia[9] remained very limited until 1991 (Young, 1997).

Figure 2.3: Trends in fiscal variables



Note: all variables are expressed as a percentage of current GDP. Source: author's calculations using data from the Ministry of Finance and Economic Development

[9]Mainly in Tigray and Eritrea that by this time was still part of Ethiopia.

2.4.3 Fiscal trends

The 1974 revolution sparked demands from the masses both in the urban centers and in more remote ethnic communities. These political demands were readily directed to the military government itself as soon as it took power. Indeed Clapham (1988) holds that "the major effect of revolution was [...] not that the state apparatus was weakened, but that it was required to do much more." This increased role of the state implied a need to increase public resources and it was largely in line with the socialist ideology embraced by the new regime.

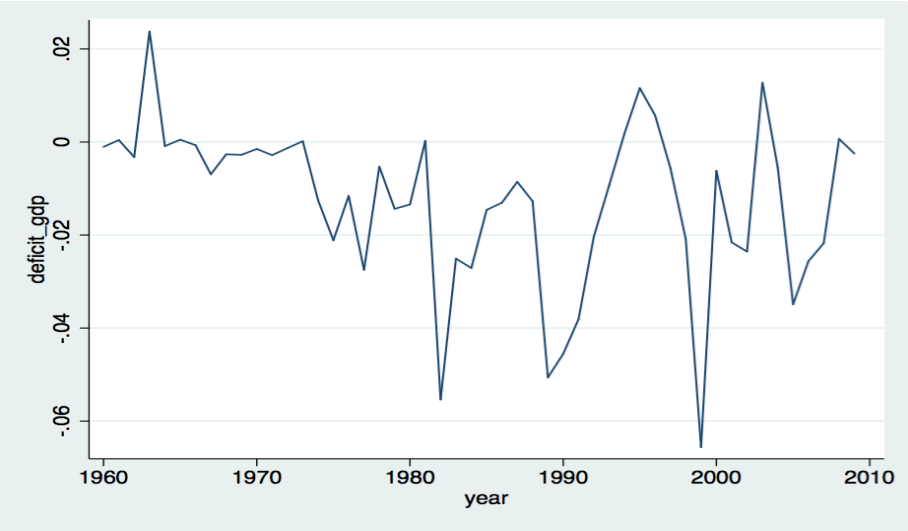
Figure 2.3 shows clearly that since its establishment in 1974 the Derg has increased both tax revenue and expenditure. The former is particularly impressive considering that the new regime had neither full control on the country nor popular support in its early years. It is therefore plausible that the increase in revenue was more the result of coercion and intimidation than of a genuine social contract, particularly given the contemporaneous shrinking of the development and services budget in favor of military expenditure.

Non-tax revenues also increased significantly, initially due to the expropriations carried out in the first years of the regime (Clapham, 1989) and to the contribution of state firms to the budget through 'government investment income'. This represented the transfer of post-tax profits to the government, so that state enterprises contributed both through tax and non-tax revenue. In addition the government was extracting surplus from the agricultural sector using a system of quotas and price controls, although these resources did not show in the budget (see appendix 2.A for more details).

Despite the increase in revenues, the government was still experiencing a resource gap resulting in increasing levels of debt (Eshetu Chole, 2004). The increase in budget deficit appears clearly in figure 2.4 that shows an increase in the use of this instrument exactly starting from the 1974 revolution. As far as foreign debt is concerned, the situation deteriorated so much that in 1990 payments of all debt obligations were frozen except those to international financial institutions and other critical ones (Eshetu Chole, 2004).

All fiscal variables, and particularly tax, non tax revenue and expenditure, seem to peak in 1988/89 then decrease steadily until the end of the regime in 1991. This decline is due to the deteriorating economic, military and political situation in the country. The economic crisis is essentially the result of over a decade of poor economic policies, including the overextension of the state in the economy, a bad investment climate, and the deterioration of terms of trade (Eshetu Chole, 2004). Militarily the Derg was suffering huge losses and defeats in the north and the morale of the armed forces was quickly deteriorating. This

Figure 2.4: Budget deficit as a share of GDP



Note: Deficit is calculated as total revenue, including budget aid, minus total expenditure. Source: author's calculations using data from the Ministry of Finance and Economic Development

situation was further worsened by the attempted coup that not only was a demonstration of political dissent but also it showed a fracture within the military.

The economic crisis was accompanied by a fiscal collapse. On the domestic side, this was fuelled by the loss of control of rebel areas as well as the declining GDP per capita (see figure 2.5 in the next section). Moreover the initial returns from increased extraction capacity were vanishing (Clapham, 1988). While high tax rates might have generated revenues at the beginning, they, together with other Derg's policies, contributed to a shrinking of the tax base that kicked in only later and it resulted in a decrease in tax revenue. A government official of the time noted that top tax rates were applied to a decreasing amount of people and businesses, as the country was getting impoverished. On the international side, it is due to the disruption of aid flows both from the Soviet block and from Western donors, who thought the days of the Derg were numbered and adopted a 'wait and see' attitude (Eshetu Chole, 2004).

Taxation

As far as taxation is concerned, the distinctive feature of the Derg regime was the exceptionally high marginal tax rates imposed on income, in all sectors. The agricultural income tax had an 89% rate for top brackets, i.e. for incomes above 36000 ETB per year (roughly 2000 USD) (Griffin, 1992). Comparable rates were also applied to personal incomes and business profits.

Clearly this situation fuelled economic decline and it increased tax avoidance. As

emerged from interviews, nobody had any incentive to increase their income, individuals and private businesses alike, given that the benefit would accrue mainly to a state that was delivering little in return. There is no doubt that this attitude contributed to the economic decline that became apparent in the last years of the regime.

However the Derg could count on relatively easy to collect taxes such as indirect and trade ones. These were relatively easy to administer, as they were collected respectively at the factory gate and at the border. Moreover the large state sector, including farms and enterprises, was a source of both tax and non-tax revenue. Finally most taxes were collected in urban centers that largely remained under government control even when the guerrilla was ongoing in the countryside (Young, 1997; Clapham, 1988).

As far as agricultural taxation is concerned, two main tax types were levied: the agricultural income tax and the land use tax. These were introduced by the Derg and they largely replaced the previous system of obligations. The contribution of agricultural taxation to state revenue more than doubled in the early years of the Derg (Markakis, 1989). However tax incidence in rural areas after the reform is estimated at 5% (Griffin, 1992) and Eshetu Chole (2004) holds that generally the agricultural sector was not an important source of tax revenue. Although peasants were requested to pay tax, they received little in return as most resources were directed to state farms (Markakis, 1989).

Family farms were also discriminated in terms of the land use tax, that was levied irrespective of location or soil fertility. The annual rate was 10 Birr (about 0.5 USD) for those who were not members of cooperatives, 5 Birr for those who were members and 2 Birr per hectare for state farms (Eshetu Chole, 2004). The tax was levied per holding and regardless of the plot size. Also falling on the agricultural sector were trade taxes, with the coffee sector being one of the main sources of revenue. Clapham (1987) reports that the share of export price paid to producers fell from 67% before the revolution to 33% afterwards. Notwithstanding this heavy burden on producers, little evasion was possible given the tight controls of the government which included internal customs to prevent smuggling (Clapham, 1987).

In a last attempt to gain popularity, and realizing the declining international standing of socialism, the Derg tried to introduce some degree of liberalization in the economy starting from 1988. In particular this entailed the expansion of fiscal incentives for investment, including exemptions from custom duties and income tax. Moreover in 1990 the top marginal income tax rate was reduced from 89% to 59% (Eshetu Chole, 2004). However the reform of the dying regime was too little and too late.

2.5 The Ethiopian People's Revolutionary Democratic Front: 1991 - today

Throughout the Derg regime liberation movements had been active in the country and particularly the Tigray People's Liberation Front (TPLF) and the Eritrean People's Liberation Front (EPLF), the two forces that eventually led to the defeat of the military regime. After 16 years of armed struggle starting in 1975, they finally reached Addis Ababa in May 1991. Recognising the defeat, which to many observers had been just a matter of time for a couple of years, Mengistu fled to Zimbabwe. Proving its weakness, the façade of political institutions the Derg had created, including the Worker's Party of Ethiopia, valished instantly upon the fall of the regime (Markakis, 2011).

2.5.1 Transition and ethnic federalism: 1991-1998

The TPLF not only played a central role in defeating the Derg, but it also deeply shaped Ethiopian politics after 1991. During the armed struggle it developed strong local ties, through its fighters who were living in very modest conditions with the peasantry. The TPLF could also count on a very strong organizational, administrative and military apparatus used to administer the liberated territories under the Derg and to keep the military regime confined to urban areas. In 1980-82, the TPLF controlled about 80% of the territory in Tigray where 90% of the people lived (Young, 1997). The military progress however was compromised by the famine of 1984 that completely disrupted the TPLF's activity. The organizational skills developed in the 80s proved crucial when the front had to govern the whole country. Finally, the TPLF had a well developed ideology based on revolutionary change, democracy, transparency, collective leadership and the refusal of a cult of personality for a single leader.

Aware of the need to give itself a national standing in view of the weakening and eventual defeat of the Derg, the TPLF promoted the creation of the Ethiopian People's Revolutionary Democratic Front (EPRDF) in 1989. The EPRDF, which is still governing Ethiopia today, is an umbrella organization composed of different ethnic-based fronts and parties, including the Amhara, Oromo, Tigrayans and Southern People. The EPRDF initially embraced a Marxist ideology that however was later softened to ensure alliances in the West (Young, 1997; Hagmann and Abbink, 2011).

While the experience of the struggle was crucial to the TPLF and EPRDF success, it also posed some difficulties as regards the transition from a guerrilla movement to a

national government. First of all, there was a need for national representativeness beyond the northern provinces. Secondly some of the traditional practices of the EPRDF, such as the system of evaluation of the leadership[10], found opposition amongst bureaucrats at the national level. Thirdly the rise to power of EPRDF resulted in a gradual distancing of its leadership from its peasant base, that was ever more anxious to see its demands met as well as improvements in terms of poverty and development (Young, 1997; Medhane Tadesse and Young, 2003).

Since the transitional conference that eventually formalized the EPRDF government with Meles Zenawi as President, the focus was largely on ethnic groups and nationalities. The EPRDF essentially accepted the right of self determination "up to and including secession", which was enshrined in the 1994 Constitution. Indeed in 1994 Eritrea separated from Ethiopia following a referendum that resulted in a staggering 99.8% of the votes in favor of independence (Young, 1997). In 1992 regional elections were held where ethnic groups were allowed to choose leaders from their own background (Young, 1997; Abbink, 2011). Elected officials were trained in EPRDF special schools on the party's program and then sent back to the regional level (Markakis, 2011). In the meantime EPRDF troops and officials were sent to the periphery to ensure control and administrative support. The only challenge for the new government was the Oromo Liberation Front (OLF) that never collaborated with the EPRDF and boycotted the 1992 elections. General elections were held in 1995, resulting in an overwhelming EPRDF victory, the establishment of the Federal Democratic Republic of Ethiopia and the confirmation of Meles Zenawi as leader (now Prime Minister).

As in the case of the Derg, the EPRDF benefited from the legacy of a strong state which was used as an administrative base rather than being dismantled. Indeed *kebeles*[11] were maintained and they later became a central tool for government control in the periphery. The challenge therefore was the democratization and legitimization of a state that was largely inherited by the Derg (Young, 1997).

Ethnic federalism

The most important characteristic of the new government by far was the decentralization of the state and the introduction of ethnic federalism. The level of ambition and radical

[10] The evaluation system adopted during the armed struggle was called *gim gimma* and it was essentially a process of popular critical evaluation aimed at assessing the front's policies, programme, leadership and conduct (Medhane Tadesse and Young, 2003; Hagmann and Abbink, 2011).

[11] *Kebeles* are the lowest level of decentralized public administation.

change of the federalist project cannot be underestimated, as underlined by two interviewees with a long experience in Ethiopia. This is enshrined in a quote from Meles, from an interview released in 2010 at the 5th International Conference of Federalism [12]:

> "Unlike other developmental states [...], the approach here is for massive grassroots mobilisation. You can't have massive grassroots mobilisation on the basis of a national uniform plan. It has to vary not only from region to region but also from village to village, because the circumstances in each village are unique. So the national plan, the national framework, is just that: a framework on the basis of which every village will have to write its own story, but a story that will add up into the national development plan."

Partly because of its ambitious and innovative character, the implementation of the federalist project encountered a few challenges from the very beginning. These included the definition of ethnic groups, the adoption of local languages, and the legitimization of the new administration in areas where the EPRDF was less rooted than Tigray such as Oromia, Amhara and Southern regions. As a result, often the EPRDF had to get actively involved in creating the conditions for decentralization, with training and propaganda (Markakis, 2011). Easing the capacity constraints at the local level was in the mandate of the Ministry of Federal Affaires that also ensured the involvement of the central government in regional affaires (Abbink, 2011).

While ethnic federalism was clearly the main feature of the EPRDF period, and indeed it was *de facto* in place already in 1991, full implementation and operationalization were rather challenging throughout the 90s. The project was then complemented with the *woreda*-level[13] decentralization started in the early 2000s and characterized by more administrative than ethnic salience. This process entailed the multiplication of *woredas* across the country and it thus involved a huge increase in local resource needs both in terms of human resources and financing.

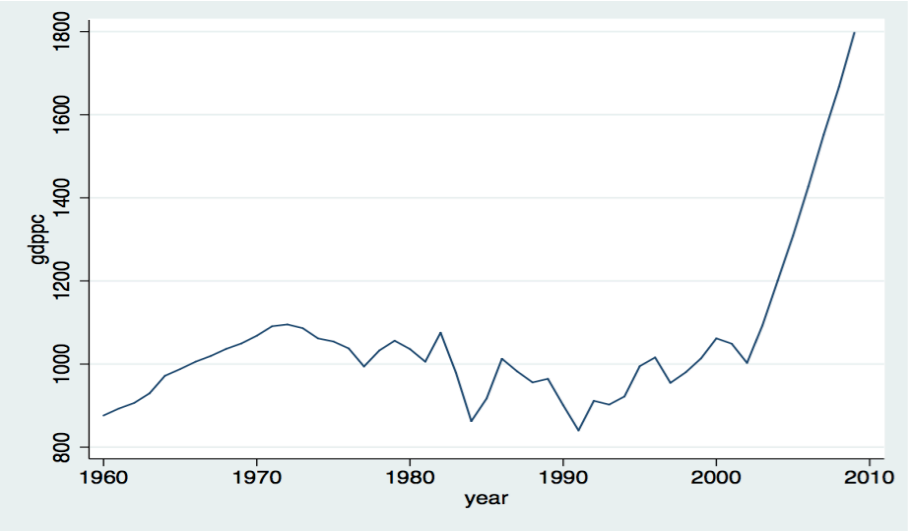
2.5.2 Economic policies in the 90s

The Ethiopian economy taken up by the EPRDF in 1991 was in dire conditions (Markakis, 2011). Figure 2.5 shows that GDP per capita had been decreasing ever since the mid 80s. A few years after taking power Meles Zenawi, aware of the centrality that economic poli-

[12] See www.ethiopianfederalism.org.
[13] *Woredas* are the local level of administration at a further decentralized level below Regions.

cies would have, started a degree in economics at the Open University in Britain and instructed cabinet officials and fellow guerrilla soldiers to do the same. He later continued his education at the Erasmus University in Rotterdam and his thesis titled "African development: dead ends and new beginnings", completed in 2004, is still a reference document for understanding the economic policies of Ethiopia (Gill, 2010).

Figure 2.5: GDP per capita at constant prices



Source: author's calculations using data from the Ministry of Finance and Economic Development

In the early 90s however the Government was still dealing with political issues, not least the establishment of ethnic federalism. Partly to ensure Western support and partly to distinguish itself from the previous regime, the EPRDF declared its intent to move towards a market economy, although the real commitment was unclear (Eshetu Chole, 2004). In this context, in the early 90s the EPRDF started a process of liberalization and privatization under the auspices of the international financial institutions. Financial and technical support was provided already in 1991 by the African Development Bank, the European Community, the World Bank and the International Monetary Fund, that later supported also the Structural Adjustment Program (SAP) of 1993-96.

One of the sectors to be liberalized, at least partly, was the financial sector that so far had been dominated by the Commercial Bank of Ethiopia. Reforms in the early 90s allowed the private sector to engage in banking and insurance, although this was restricted to Ethiopian nationals (Alemayehu Geda, 2011). The liberalizations involved also the agricultural sector, reintroducing hired labour and eliminating restrictions to plot size (Markakis, 2011). The EPRDF also encouraged capitalist farming and the establishment of larger plots, particularly in the lowland areas (Young, 1997). However public land

ownership was maintained and even given a constitutional basis. The need to increase productivity of smallholders and the importance of industrialization were enshrined in the Agricultural Development Led Industrialization (ADLI), a long term strategy that entailed a focus on agriculture and that continued to shape development efforts for many years hence (Alemayehu Geda, 2011).

Privatizations were also carried out but its implementation was slow, also due to the lack of private investors. This slow progress is part of the reason for delayed payments under the SAP, which after the first tranche of 1993 were frozen for 23 months (see figure 2.8). The privatizations often resulted in the transfer of ownership from the state to members of the party or party affiliates[14] (Markakis, 2011). Since the role of the party in the economy was formally outside the state proper, the issue did not raise the complaints of the international community. A truly private sector therefore remained limited, also due to the lack of faith that the EPRDF had in it as a promoter of development.

While some effort was made towards liberalization, the interviewees with direct experience of this period hold that the process was undertaken reluctantly and half-heartedly. The EPRDF was still essentially anchored to marxist ideals and it did not have faith in a purely market oriented economy. Indeed the limits of the liberalization process were very clear for the Ethiopian government. A few issues remained non-negotiable then, and still are not today, such as public land ownership, the liberalization of telecommunications and the international opening of the financial sector. This tendency to a large role of the public sector will become more clear with the emergence of the idea of developmental state.

2.5.3 The war with Eritrea and the TPLF crisis: 1998-2002

The late 90s and early 2000s represented a turning point for the EPRDF and they marked the emergence of its current profile.

In 1998 war erupted with Eritrea over a border dispute, after years of rather peaceful relations. This caused the suspension of aid disbursements to Ethiopia on grounds of a 'peace conditionality' based on the view that development aid could not be delivered to a country that was scaling up its military spending, which Ethiopia was indeed doing massively during the war (Gill, 2010; Markakis, 2011).

While the war was raging the country, bad rains in the area of Wollo and in the Somali

[14] One example is the Endowment Fund for the Rehabilitation of Tigray (EFFORT) established by the TPLF in 1995. EFFORT was a conglomerate of industrial, financial and service enterprises meant to help the reconstruction of Tigray. Other regions later followed this example and established similar bodies.

region caused acute food shortages. Since aid was not available, or at least was much short of what was needed, the affected people had to sell their assets and thus they became even more vulnerable to the subsequent drought (Hammond and Maxwell, 2002). There is little doubt that the war with Eritrea was a major reason for the slow response of donors to what was called an 'averted famine', although many in the affected areas suffered of severe malnutrition and died as a consequence (Hammond and Maxwell, 2002).

A truce was eventually reached in 2000 with the mediation of the Organization of the African Union (OAU) and the United Nations. An agreement was reached on the border issue in 2001 and aid resumed. However the tension with Eritrea remained high and the two countries suspended all relations.

One of the consequences of the war was the emergence within the party of two factions. The first one, led by Meles and eventually prevailing, was more sensitive to international pressure and it was thus in favor of a conciliatory approach that would lead to an early ending to the conflict. The second faction was for a full scale offensive against Eritrea (Medhane Tadesse and Young, 2003). The war was certainly one of the causes of the 2001 TPLF crisis, but not the only one.

The tension within the party was further exacerbated on the occasion of one of the TPLF's customary evaluations. The main themes of discussion, presented by Meles, were the decaying of the TPLF leadership, the increasing distance from its constituency and the concerns over the influence of foreign powers in Ethiopia (Medhane Tadesse and Young, 2003). These were far reaching and delicate themes that indeeed sparked a heated debate from which Meles emerged as the undisputed leader (Medhane Tadesse and Young, 2003).

The crisis marked a turning point in the history of the EPRDF for at least three reasons. First, the emergence of a strong single leader implied a shift away from collective leadership and towards centralism. Secondly it underlined the need for the EPRDF to improve national legitimacy, thus softening the ethnic discourse. The focus switched from ethnicity to poverty and economic development. This entailed a massive increase in resources for development and service delivery at the *woreda* level starting in 2001. Notably devolution of powers to the *woreda* level had no ethnic salience as it was a purely administrative process. Thirdly the attention moved from political to economic issues, in a partial ideological shift. The government was now willing to be integrated in the world economy and to open to capitalism, which was never clearly indicated before. However the EPRDF maintained some central features, such as the central role of the state in the economy, the commitment to federalism, public ownership of land, and support for the

peasants (Medhane Tadesse and Young, 2003). Moreover the link between the party an the state strengthened even more after the crisis.

In this context, foreign relations were enhanced as Meles was seen as a moderate modernizer (Markakis, 2011). The role of donors was crucial in determining the fate of the war, and thus in the crisis as well, with the imposition of the 'peace conditionality'. The government coming out of the 2001 crisis was certainly a good ally of the West but also a more assertive and confident one than donors had gotten used to during the 90s.

2.5.4 Consolidation and reform

As the political challenges were overcome, the government could fully focus on economic issues. The underlying ideology for economic policy in the 2000s was that of a developmental state. This concept is largely in line with the idea of revolutionary democracy[15] that characterized the TPLF/EPRDF since the struggle and that after 2002 was more forcefully opposed to liberal democracy. The ambiguous relation between the idea of developmental state and the opening to the market economy caused some tension with international donors. However Meles was not willing to compromise and he remained unpersuaded by the validity of applying liberalism to a developing economy. His view was reinforced by the support of prominent economists like Joseph Stiglitz who was not only his mentor but also a personal friend (Gill, 2010; Dereje Feyissa, 2011). In 2008, during a two hours questions session following the presentation of his thesis on the developmental state[16], Meles reportedly said[17]:

> "We in Ethiopia very nicely and politely have rejected a number of neoliberal prescriptions given to us, and we have lived to tell the story"

In this context of renewed confidence the government also reappropriated the political space for reform that was largely limited before 2001, as suggested by a top government official with a long experience with the EPRDF. The Civil Service Reform started in 1996 was revived in the early 2000s. The overarching objective was to create a qualified and technically prepared civil service, including in the area of tax administration (MOFED,

[15] Revolutionary democracy was the ideology adopted by the TPLF/EPRDF to promote democratization in Ethiopia and the empowerment of ethnic groups. The concept has its roots in Leninism, though it is infused with democratic principles (Abbink, 2011). Indeed it postulates the need for a strong vanguard party, ruling in the name of the rural masses, the commitment to the right of self-determination, the intertwining between the party and the state, and their dominant role in politics, the economy and society (Abbink, 2011; Hagmann and Abbink, 2011).

[16] "Dead ends and new beginnings" is Meles's thesis where the concept of developmental state is outlined.

[17] Cited in (Gill, 2010).

2002). In 2002 a major reform was carried out in the area of taxation as well, that had received only marginal attention since 1991. The reform represented a major effort to improve revenue mobilisation that was falling short of the needs stemming from administrative reforms, decentralization and the re-militarization carried out during the late 90s. Notwithstanding the rocky relations with the IMF, the area of taxation was actually one in which there was much agreement and indeed the IMF, along with other donors, played a crucial role in supporting the tax reform (see section 2.5.6 for details).

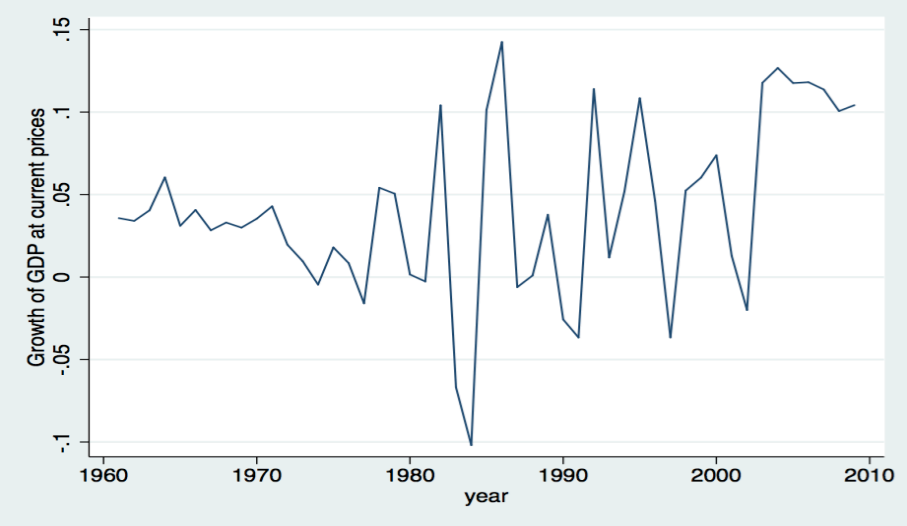
The renewed confidence of the EPRDF after the 2001 crisis may also help explain the liberal approach adopted towards the 2005 elections. The run up to the elections was marked by much fervor, with the emergence of partisan newspapers and publicly broadcasted debates (Markakis, 2011; Gill, 2010). Many interviewees remember the absolute confidence of the EPRDF to win the elections that were seen more as an opportunity for broad endorsement and fine-tuning than for a radical change. The opposition parties, opposed to federalism and supporting more liberal economic policies, eventually lost the elections after a heated debate in which both sides claimed victory. In the months following the elections tension was high and violence erupted in the streets in November 2005, causing 200 deaths (Markakis, 2011). International donors, particularly the EU, adopted a hard line against the Government and the situation quickly escalated to a personal confrontation between Meles and Ana Gomes, the electoral mission's chief observer (Gill, 2010). The political ferment preceeding the 2005 elections was never seen again, with essentially no organized opposition operating in the country since then (Markakis, 2011).

Although the government won the elections, the result was a major blow as the opposition succeeded in getting a substantial number of votes. This shock prompted a moment of reflection and evaluation within the EPRDF leadership. This process resulted in a reinforcement of the developmental state as the main ideology of the EPRDF. In the aftermath of the 2005 elections it became even more clear that the government's legitimacy would be based on its strong and effective role in development and poverty reduction in the name of the people of Ethiopia. The renewed focus on national development also sped up the move from ethnicity to nationalism already underway in the EPRDF since the early 2000s.

It is in this context that the government engaged in a 'big push' towards GDP growth and economic development that emerged clearly in the 2005 Plan for Accelerated and Sustained Development to End Poverty (PASDEP) and even more so in the 2010 Growth and Transformaiton Plan (GTP). The new enemy was now poverty and the nation was

called to unite towards its eradication.

Figure 2.6: Growth rate of GDP at constant prices



Source: author's calculations using data from the Ministry of Finance and Economic Development

Following the developmental state thesis, the government scaled up massively its efforts in infrastructure development. One of the best examples of this are the dams currently being built, including the Great Ethiopian Reinassance dam on the Blue Nile River. Notably this dam, which will be the biggest of its kind in Africa, is fully funded with domestic resources since donors did not want to get involved due to the dispute with other countries regarding the Nile waters. This dam emerged in many interviews as a symbol of Ethiopian independence and pride.

On the agricultural side progress was made to attract foreign investors in commercial agriculture. Land lease contracts were stipulated in the context of what is internationally labelled 'land grab' or 'the second scramble for Africa'. These contracts entail very low tax rates on profits and exemptions are granted for several years since establishment (Markakis, 2011). In both cases of land lease to foreign investors and the construction of dams, the process is largely controlled from the top, thus confirming the growing tendence to centralism.

The 'big push' for development expenditure and economic growth is reflected in GDP figures that show staggering growth rates, consistently at double digit since the economy recovered from the 2001-2002 drought (see figure 2.6). Figure 2.5 shows that GDP per capita doubled since the early 2000s. While these figures are partly justified by the projects and scaling up of service delivery at the *woreda*-level, they are also the object of much criticism by the IFIs as well as academics (Dercon and Zeitlin, 2009). The IFIs have

argued that GDP figures are largely inflated and the continuous confrontation with the WB's former Country Director Ken Ohashi was mentioned several times in the interviews.

In conclusion, it seems like the EPRDF went gradually back to the tradition of centralism that was typical of the previous regimes. The thesis of transformation and continuity developed in Clapham (1988) is therefore picked up again by observers of today's Ethiopia such as Abbink (2011). Moreover Markakis (2011) holds that this tradition of authoritarianism and centralism inherited from the imperial period is precisely one of the two obstacles that Ethiopia is still to overcome, together with the integration of the lowlands populations in the periphery of the state.

2.5.5 External relations

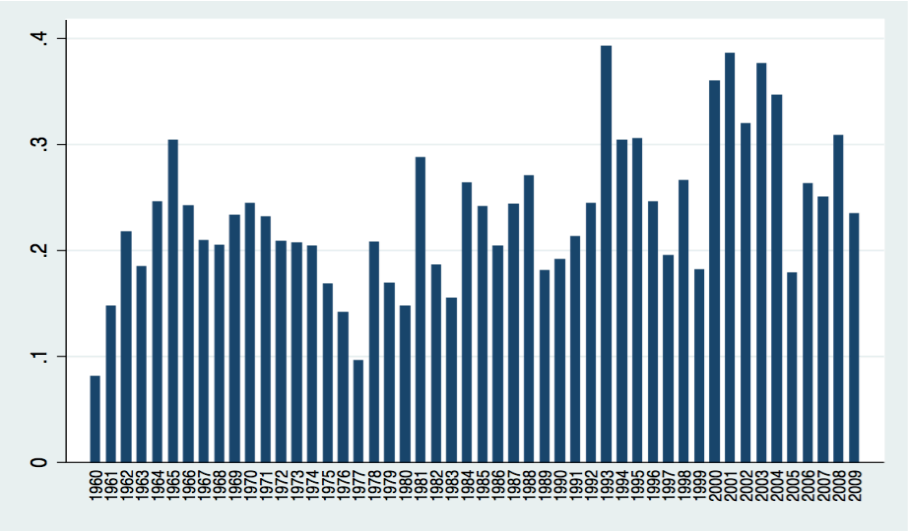
Since aid and the relation with donors[18] was a central part of the interviews, this section is largely based on interviews to both government and donors officials.

After 1991 Ethiopia has received increasing amounts of aid, in the context of development programs such as the 1991 Emergency Recovery and Reconstruction Program and the 1993 SAP. As reported in table 2.1, grants and loans amount to about 3% of GDP each in the EPRDF period, adding up to a 6% for all aid. In terms of aid dependecy, defined as total aid (loans and grants) as a share of total expenditure, the average in the EPRDF period is 28% (see table 2.1). Figure 2.7 shows that aid indeed increased as a source of governemnt funding in correspondence with the SAP. While these figures may seem high, it is worth noting that aid per capita was only 211 ETB per head in 2009/2010 (equivalent to about 7.5 GBP).

In the 90s the government engaged in the liberalization process described in section 2.5.2 as part of a "strategic softening" of EPRDF ideology (Dereje Feyissa, 2011). This not only allowed the party to obtain funds for reconstruction and new allies, but also to draw a clear distinction with the Derg, notwithstanding several ideological similarities. Despite the fact that the development strategy in the 90s was largely dictated by donors, the EPRDF was able to draw clear lines for what it was willing to accept. An interviewee put it rather neatly, dividing policy dialogue in three categories. The first one is the area of agreement, including topics like health and education. The second one is the area of

[18] Ethiopia has received over the period more multilateral than bilateral aid, with the main multilateral donors being the World Bank (IDA), the UN system (UNICEF, UNDP and WFP for emergency assistance), the European Union and the African Development Bank. On the bilateral side the largest bilateral donors have historically been the United States, Japan, Italy and Canada, with also Germany, The Netherlands, Norway and the UK playing an important role.

Figure 2.7: Aid dependency: grants and loans as a share of total expenditure



Source: author's calculations using data from the Ministry of Finance and Economic Development

compromise, where ideas proposed by the donors may be adopted even if the government is not really enthusiastic about it as long as they are in line with the government's vision. The third one is the 'no-go' area and it includes topics like the liberalization of the financial sector, of telecommunications and the privatization of land. In this area no compromise was reached even in the 90s.

The first clear rupture in donor-government relations occurred in 1998 when donors stopped aid to Ethiopia because of the war with Eritrea, which also coincided with the 'averted famine'. This rupture fuelled the Ethiopian government's perception that donors were unreliable and not trustworthy as they abandoned the country at a time of need. Moroever the relations with foreigners were at the centre of the TPLF debate thus sparking a strong willingness to maintain control and independence over policy making. Indeed the problem of the government was to "maximize the inflow of resources (so it can finance as much as possible), while giving up as little sovereignty (in terms of control over the policy agenda) as possible" (Furtado and Smith, 2007).

When donors came back to the country in 2000, the approach to development was shifting towards untied budget support, the use of country systems and a stronger focus on ownership (Dereje Feyissa, 2011). The first poverty reduction strategy program, the Sustainable Development and Poverty Reduction Program (SDPRP), adopted in the early 2000s, had a strong focus on untied budget support. This is reflected in figure 2.7 that shows increased foreign presence in the budget at this time, sustained by the strong commitment to development of the Ethiopian government that was providing a 'posi-

tive development story' for donors. However this commitment was not the only element attracting donors and perhaps not the most important one either.

The terrorist attacks of September 11th 2001 reinforced the strategic significance that Ethiopia had lost with the end of the Cold War, but that had already been revived by the bombings of US embassies of Nairobi and Dar es Salam in 1998 (Dereje Feyissa, 2011). With the start of the war on terror Ethiopia became a crucial ally of the US in a region (the Horn) of political instability and extreme islamist tendencies. During my interviews with the donor community, even the most technocratic institutions recognised that geopolitical factors are the main determinants of aid in the country. An interviewee put it rather clearly: "donors want to stay in Ethiopia for two reasons: first, development objectives and poverty reduction; second, strategic interests. But really, the order is more realistically reversed." This view is confirmed in virtually all interviews within the donor community and it is also supported in Furtado and Smith (2007) when they state that:

> "Changes in the level of donor assistance to Ethiopia have been driven overwhelmingly by political and geopolitical considerations [...]. These factors, rather than anything the government has consciously done to manage the aid agenda, have largely determined the level of aid inflows."

As capacity constraints were still a major issue both in the center and in the periphery, the US$483 million Public Sector Capacity Building Program (PSCAP) was launched in 2004. PSCAP was aimed at improving public service delivery at all levels of the public administration, increasing citizen participation and enhancing good governance and accountability in the public sector. One of its six workstreams is focussed on taxation and it entailes reinforced collaboration with donors on tax reform and revenue mobilisation, for example including twinning programs between tax authorities in Ethiopia and the UK.

A second rupture occurred in 2005 when donors condemned the post-election violence and withdrew untied budget support, which by that time was planned to be scaled up from US$375 to US$500 million (Furtado and Smith, 2007). In a climate of renewed distrust and tension, donors rather quickly came up with a solution in the form of a project, the Protection of Basic Services (PBS), that was going to become the largest of its kind in Africa. The largest component of PBS provides for service delivery at the local level through the government's financial management system and particularly through the block grant to the regions. PBS more recently funded a project aimed at increasing transparency and accountability that entailed the publication of the local administration's budget in public places such as churches, mosques and *kebeles*. Disclosure and dissemination of

budget information was also supported by the use of media such as TV and radio, as well as budget literacy trainings for citizens at the *woreda* and *kebele* level.

An official from a major donor agency noted that, far from being a punishment for the 2005 events, PBS turned out to result in more and better aid for Ethiopia. Not only did the program reinforce the local service delivery that the government was pursuing strongly as a mean to reduce poverty and to increase legitimacy, but also it caused the disappearance of donors (in terms of visibility) as all the improvements at the local level were seen as achievements of the government. In addition the increased focus on service delivery meant a closure of the arenas for policy dialogue on broader macroeconomic issues, that were present under untied budget support. The government welcomed this development that however donors might have not fully foreseen.

As a result of the ruptures in donor-government relations, the 1998 and 2005 being only two of them[19], and the the long tradition of independence and statehood, it is not surprising that donors in Ethiopia have little influence over policy and the development agenda. This not only emerged during the interviews but is also confirmed by several scholars (Abbink, 2011; Furtado and Smith, 2007). For example, it is recognised by donors that the conditionality provided under PBS is hardly enforced and enforceable, besides being rather soft. Moreover the assertiveness of the government towards 'traditional donors' is certainly enhanced by the emergence of new donors and most notably China.

Generally the Ethiopian government over the years has shown a great degree of ownership over the development process that has somehow put donors in an uneasy situation. On the one hand they would like to have a voice in policy making. On the other hand ownership is precisely what donors wanted to promote under the Paris Declaration on Aid Effectiveness, amongst others. They are therefore not in a position to criticize the government for taking the ownership that they should rather encourage.

2.5.6 Tax revenue mobilisation

The new government in 1991 was able to take over the remains of the administrative apparatus relatively quickly. Both officials and observers consistently confirmed that the state was actually functioning throughout the transition with as little as one week of admin-

[19]For example, the Ethiopian government had several disagreements with the IMF and notably it is not a 'program country' of the IMF, which is therefore only covering a surveillance and advisory role in the country. The reason for this, emerging in the interviews, is that Ethiopia is not willing to take the conditions and pressure on policy making that an IMF loan would entail. Disagreement also emerged when donors refused to fund big hydroelectric projects such as the Reinassance Dam that is seen as a centerpiece of the country's development strategy.

istrative 'blackout'. However the fiscal situation inherited from the Derg was disastrous. Not only revenue was low and decreasing for three years in a row, but also arrears on debt payments kept accumulating. A top government official suggested that at the beginning of the EPRDF period debt was a central concern of the new government, more pressing than increasing revenue. Indeed the government succeeded both in reducing deficit (see figure 2.4) and in incrasing revenues that in 1992 increased by 36% and still at a sustained double digit rate until the war with Eritrea in 1998. These great improvements in fiscal policy were partly due to the very low level of tax collections under the 'fiscal collapse' of the Derg, that was relatively easily reversed with the start of the new regime; and partly to the fact that the EPRDF by the early 1990s had already good control of many regions in Ethiopia where instead the Derg had almost no authority anymore. Moreover the dismantlement of the huge Derg's military apparatus decreased expenditures substantially, therefore contributing to decreasing deficit.

Although progress was made in increasing revenue from the historical lows of the Derg, the EPRDF performance remained weak for a number of reasons. First, revenue generation had certainly suffered from the secession of Eritrea, that was more industrialized than Ethiopia, and from the dismantling of nationalized firms. Moreover tax revenue mobilisation was constrained by the desire to keep the fiscal burden on peasants low, who were the main constituency of the EPRDF (Young, 1997). Last but not least the 90s were a period of great political change, as noted in section 2.5.2, thus limiting both the capacity and the policy space for reform. Tax policy was no exception and a high ranking government official described the EPRDF's attitude towards it as "relaxed" in the 90s. The reasons for this, he explained, were the low expenditure needs[20] and the limited capacity to implement programs, by which he meant political space too. Indeed the top marginal tax rates were kept at Derg's levels until 1994, at 59% on businesses income and still 89% on personal income (Eshetu Chole, 2004).

However a few policy changes were carried out by the EPRDF in this period. Proclamation 107/1994 amended the previous income tax law (Proclamation 173/1961 and amendments) and brought maximum marginal tax rates to 35%. In two separate proclamations in 1995 and 1997 also the tax on rural land and agricultural income was reviewed, introducing tax exemptions for two consecutive 5-year periods for agricultural investors (Alemayehu Geda and Abebe Shimeles, 2005). These were adjustments of tax law rather than major

[20]The great demilitarization process following the fall of the Derg was surely a major determinant of decreased expenditure needs.

reforms, with the other relevant tax event being the introduction of the turnover tax whose implementation however was phased in over a few years.

The war with Eritrea further distracted the government's attention from economic issues and indeed it captured virtually all the national efforts until 2000. Observers close to the government remember that little or no attention was given to the economic situation at that time, let alone fiscal policy. Revenue generation stagnated between 1998 and 1999 (see figures 2.3 and 2.8) and deficit increased to an historical high (see figure 2.4). However the increase in deficit was also due to the food shortages that the government had to meet with increased borrowing as foreign aid was not available until the end of hostilities in 2000.

It is in the early 2000s, in the context of a more peaceful political setting and a renewed commitment to developement, that tax revenue mobilisation became a higher priority for the government. Revenue needs increased massively: the increased militarization achieved during the war was going to be sustained, the *woreda*-level decentralization and the infrastructure projects implemented in the context of a developmental state also required huge resources. Since the delivery of services at the local level was becoming a basis for legitimacy, finding resources for development plans became even more pressing.

It is in this context that the major tax policy reform of the EPRDF period took place in 2002. The reform entailed both an income tax proclamation (Proclamation 286/2002) and a law on indirect tax (Proclamation 285/2002). The former further decreased the higher marginal income tax rate from 35% to 30% and introduced various deductions for the calculation of business profits. In addition it included Tax Identification Numbers (TIN) that had to be assigned to all businesses and individual taxpayers in urban areas. A generous set of incentives for investment, both foreign and domestic, was provided for. Amongst these were tax holidays that also include a regional development element, providing for longer periods of exemption for investments in more remote regions.

The main innovation of the second proclamation was surely the introduction of the Value Added Tax (VAT) starting from 2003, that was meant to substitute previous indirect taxes (i.e. sales and turnover tax). Other taxes were also introduced in the early 2000s such as the surtax on imports, the withholding tax on income and the interest tax, while taxes on exports were brought to zero starting from 2003.

Implementation of the reform however was difficult, particularly as far as the VAT and TIN are concerned. Indeed figure 2.3 shows that the tax share (of GDP) actually decreased following the reform. This decline was explained by government officials by

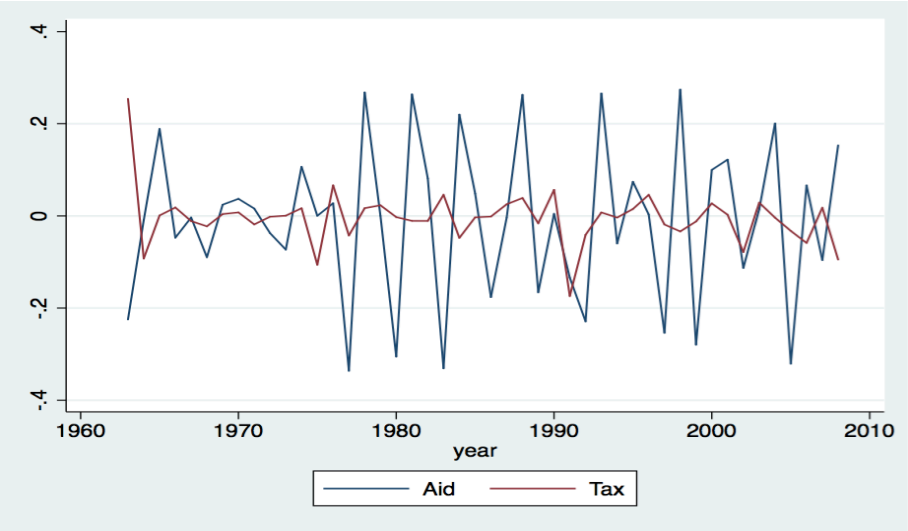
implementation problems due to the lack of taxpayer's collaboration and capacity constraints in the government. Not only did the reform find the resistance of taxpayers, but also of the tax administration that, a top government official explained, was not happy about improved systems of collection that would undermine the unofficial benefits that tax officials were able to extract from a mismanaged system. A foreign observer noted that the government, rather optimistically, hoped that the business sector would come forward upon the introduction of TIN and VAT while instead it backed off through tax evasion and avoidance.

Interestingly a top government official noted that while the rural sector had a strong tradition of tax compliance, notwithstanding its low contribution to revenue, urban areas did not. What is sometimes referred to as the 'modern sector', to distinguish it from agriculture, had a relatively short history in Ethiopia and it had little compliance culture, not fully perceiving the need to contribute to the government's revenue. The disengagement of the EPRDF from the private sector, at least in the 90s, might have contributed to reinforcing this problem.

The government of Ethiopia in the 2000s was fully aware that domestic financing had to have an increasingly important role with respect to foreign resources. Not only was foreign assistance insufficient to cover the incresingly ambitious development plans, but also donors were increasingly seen with suspicion and distrust particularly after the experience of the war with Eritrea. Aid had proved to be volatile (see figure 2.8) and the donors' willingness to influence the policy dialogue was more and more unwelcome. A few government officials I interviewed noted that aid is neither sustainable nor predictable, also due to the determination of the Ethiopian government to set its own development agenda that donors may not always agree upon (e.g. Great Reinassance Dam). Domestic resources instead are perceived to be under the control of the government thus offering a more stable source of revenue and, perhaps more importantly, one over which the government has undisputed decision power. Figure 2.8 shows clearly that tax revenue is less volatile than aid.

This is the spirit with which the governemnt engaged in the administrative tax reform of 2008 and 2009. First of all tax administration was unified under the Ethiopian Revenue and Customs Authority (ERCA) that was taking over the activity of the Federal Inland Revenue, the Ethiopian Custom Authority and the National Lottery Administration, previously controlled by the Ministry of Revenue. This greatly improved the status and effciency of revenue administration that was now managed under a single and in-

Figure 2.8: Deviations from three-years moving average of grants and tax



Note: the figure reports deviations from the 3-years moving average of the grants and tax series in levels.
Source: author's calculations using data from the Ministry of Finance and Economic Development

dependent authority, governed according to special rules aimed at preventing corruption and mismanagement[21]. Secondly the implementation of VAT was complemented with the introduction of registration machines that would record all firms' transactions and report them directly to the newly established ERCA. Finally a campaign against tax evasion included the imprisonment of evaders and a policy of 'naming and shaming' them in the media. The media was also used for tax education campaigns that would explain the need to pay tax and contribute to the governemnt's budget to fulfill the development plans.

The reforms of 2008 and 2009 succeded in increasing tax revenues, with the growth rate just slightly falling short of 50% in 2009 (49.4%). This trend is largely in line with the ambitious revenue goals of the latest development plan, the GTP, that foresees an average annual growth rate of 24%, against an annual GDP (at constant prices) growth rate foreseen at 11%. While some point to a tax buoyancy problem[22], the government's view is that the revenue generating potential of the Ethiopian economy is not tapped and therefore large margins still exist. The increase in tax revenue is being achieved largely with an increase of the tax base rather than changes in the tax rate, by fighting evasion, improving compliance and administrative capacity as well as bringing more taxpayers into the tax net. The target for 2015 is for tax revenue to reach 15% of GDP, from the initial 11%. This is a target that most donors, and more obviously all government officials,

[21] For example ERCA employees have higher salaries than in other public bodies.
[22] Tax buoyancy is the elasticity of revenue with respect to national income, measured as the product of the elasticity of revenue to the tax base and the elasticity of the tax base to income.

consider within reach. The GTP also sets a medium term goal for Ethiopia to become a middle income country and to become independent from foreign aid, both ambitious goals that find widespread support and commitment amongst government officials.

Despite the great efforts in increasing tax revenue, the tax share in Ethiopia, at 11% of GDP in 2009, remains lower than the average of low-income African countries of 15% (see section 1.2 in chapter 1). This is due to a few important constraints that are mostly related to a small tax base. They include both low income and the large share of the agricultural sector.

On the one hand, at low levels of income it is difficult to extract revenues. As a local economist noted, below a certain threshold income is either exempt or taxed very little. As development occurs, more people will start paying tax and they will also pay more as they move to higher tax brackets. On the other hand, the agricultural sector still contributes about 40% of GDP and 80% of the Ethiopian people live in rural areas. This sector is highly dominated by smallholding agriculture that is difficult to tax for technical reasons, exacerbated by the ties of the EPRDF with rural constitutencies. The tax on land remains almost negligible and investors can benefit from generous exemptions on business profits tax. High level government officials are aware that agriculture contributes little to tax revenue and that it may be an area for future reform.

Other major constraints consistently mentioned in virtually all interviews are capacity and compliance. The two are obviously related as low compliance is hard for the government to tackle if capacity constraints limit enforcement. In addition, a few interviewees noted that while the top tax rate is a reasonable 30%, the threshold for falling in the top bracket is very low, at 5000 Birr a month, roughly equivalent to 170 GBP. More and more people are falling into that bracket which might have been appropriate in the past but may need revision today. The relatively high tax burden of income was indeed reported in interviews as a factor increasing tax avoidance. Last but not least, international tax competition and fiscal benefits for investors are a further constraint to tax revenue mobilisation. It is noted by a few observers that ad-hoc agreements with investors imply fiscal benefits that are difficult to track and that should be more strictly regulated. Finally, the GDP figures in the denominator may be responsible for the low tax share, as inflated GDP growth would result in an artificially lower tax share[23].

[23]The level of GDP may be understated in many developing countries due to the difficulty of measuring some sectors and to informality. It is beyond the scope of this thesis to assess whether this is the case in Ethiopia, but systemtic underestimation should not alter the time series analysis. In the case of GDP growth rates, these was a debate between the government and the international financial institutions on

Last but not least, many interviews pointed to the importance of private sector companies that carry out large investment project and that have strong links with the state and the party. They suggested that a full assessment of fiscal discipline should take into account these actors that may be accumulating debt. Unfortunately data on this sector is not readily available and therefore this analysis focuses only on the public budget.

2.6 Implications for tax and aid: four underlying factors

The fiscal history of Ethiopia outlined in the previous sections allows the identification of at least four related underlying factors in Ethiopian history and culture that deeply influence the relation between revenue generation and aid. While these factors have been present throughout Ethiopian history, they emerged more clearly in the 2000s.

Before describing in detail the underlying factors however, it is useful to note that during the interviews I asked all interviewees if they thought aid and tax are treated as substitutes in Ethiopia. The vast majority of them was convinced that aid does not have a disincentive effect on tax and that the two variables are not treated as substitutes. A few foreign observers who have been working on and in Ethiopia for decades noted that substitution of tax with aid would not be in the Ethiopian character, and this is discussed more in the next paragraphs. When asked about the nature of the relationship between aid and tax, many interviewees pointed to a positive relation based on the role of aid in easing the capacity constraint of the government and in supporting economic development.

Only a few interviewees thought that either aid has no effect on tax or has a negative one. However even they agreed on the possible channels for a positive effect, namely capacity and development, and on the validity of the underlying factors presented here in the Ethiopian context. Indeed the discussion so far has shown that Ethiopia has always had foreign advisors on tax matters, thus making the capacity channel particularly plausible.

The underlying factors are discussed in the following paragraphs; they are certainly related and in some cases even overlapping concepts.

Tradition of statehood and continuity

We have shown throughout this chapter that the long tradition of stethood, interrupted only by a few years of Italian invasion, is one of Ethiopia's most valuable assets. Bahru Zewde, a Professor of history at Addis Ababa University, holds that transitions in Ethiopia

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the credibility of double digit growth rates.

were always characterized by administrative continuity and that during the transition of 1991 Ethiopia remained without a government for only one week[24]. The presence of a strong state and administrative apparatus certainly allowed the Derg and the EPRDF to undertake, within a few month since their establishment, radical reforms such as, respectively, the land reform and ethnic federalism.

In addition to the administrative apparatus, continuity regards also the culture of power and the political environment. Many scholars agree that the way authority is exercised has changed little in Ethiopian history, although certainly much has changed otherwise. Clapham (1988) notes that the following description of the Ethiopian leader, used to describe the Emperor, fits very well Mengistu too.

> "The leader was required to be both omnipresent and omnicompetent, capable of intervening at will in the smallest details of any aspect of administration, and his personal involvement was normally essential where any innovation was involved."

This quote may well describe the late Prime Minister Meles Zenawi as well, who was reportedly fully involved in decision making in virtually all areas of policy. Indeed Abbink (2011) argues that the thesis on transformation and continuity developed by Clapham (1988) still holds in contemporary Ethiopia. Many observers interviewed in the context of this research agree with that view, although under the EPRDF the tendency towards centralism developed mostly in the second decade of its rule (see section 2.5.4).

This political culture is not confined to the leadership and it would be simplistic to think that it is only imposed from the top. Instead it is largely embedded in popular culture, as shown in Lefort's research in rural Ethiopia in the run up to the 2005 elections (Lefort, 2007). The author shows that peaceful electoral competition was inconceivable in rural areas, with peasants concerned about voting for the winning side to ensure their welfare and even their survival. In their view, the fact that opposition was able to campaign freely in 2005 meant that the government had abdicated (Lefort, 2007). Along similar lines, Young (1997) notes that the lack of transparency in the first years of EPRDF rule was criticized much more by foreigners than by Ethiopians.

Finally continuity can be observed also in aid, at least in terms of flows. American aid kept flowing in socialist Ethiopia for a few years after the 1974 revolution and when it was withdrawn it was largely compensated with European and Soviet assistance. The

[24] From Professor Bahru Zewde's keynote lecture on the "Dynamics of political succession in Ethiopia" at the 18th International Conference of Ethiopian Studies on November 1st 2012 in Dire Dawa, Ethiopia.

EPRDF had already started talks with donors even before it took power in 1991 so that foreign assistance was ensured for the new government without much disruption. While aid flows are relatively resilient to regime changes, surely changes in the type of aid occurred. Interviews pointed to a certain similarity between aid under Haile Selassie and the EPRDF, while the situation was reportedly very different under the Derg. However these differences are not due to the different approach of donors but rather by profound differences in the type of regime in power, linking this discussion to the next underlying factor.

Therefore Ethiopia has experienced at least two important transitions, particularly in 1974 and 1991, entailing radical changes. Moreover the great economic, social and institutional developments in the country are to be recognised. However a large degree of continuity is also identifiable in the country and this can be considered both a challenge and a valuable asset. A challenge because the traditional political culture represents an obstacle to pluralism and democratization. An asset because the state is strong and capable of pursuing a fully owned vision for development.

Independence and national pride

The tradition of independence in Ethiopia is a major source of national pride and a central element of the Ethiopian character. Independence from colonial powers meant that Ethiopia always interacted with Western countries as a peer and when it entered the international arena it did so as a sovreign country. In his speech at the League of Nations in 1936 Haile Selassie was the first African leader to hold the West accountable for the atrocities of colonialism. The Emperor famously warned Western countries that "God and history will remember your judgment", as they were failing to protect Ethiopia's sovreignty and thus implicitly they were accomplices in the Italian invasion.

A sense of 'having to stand on its own feet' grew in Ethiopia, also fuelled by the fact that foreign aid has historically been low in the country partly due to the lack of a colonial patron (see section 2.3.3). As the aid industry developed and colonialism became less and less influential, Ethiopia started receiving more aid and attention. However it still kept the initial spirit and the presence of this rhetoric still today was reported by an observer close to the government: "Ethiopia could stand on its own feet in the past and it can still do it today".

This sentiment translated into policy in two ways. A first natural implication is of fiscal nature: great importance is attached to reliance on domestic revenues rather than foreign ones. Indeed all governemnt officials interviewed recognise that aid is only an acceptable source of finance in the short run but not in the long run, thus the goal of reaching

aid independence in the GTP. Donors involved in PBS report that Ethiopia consistently overperforms in terms of the domestic revenue mobilisation requirements embedded in PBS, an element explaining also the decreased aid dependence of the post-2005 period (see figure 2.7). This is not because of donors' conditionality, but because increased revenue generation is a top priority of the government. In fact an official from a major donor agency noted that PBS donors would have no credible way to enforce conditionality on revenue generation, as strict targets are not even set.

Secondly independence translates in a strong ownership of the policy agenda. This is particularly evident from the discussion of the EPRDF period (see section 2.5.5) but there is also little doubt on who was setting the priorities under the Derg. While Western donors had little or no voice over the policies of the socialist regime, the USSR benefited only from a little more influence due to the natural alignment of Derg's policies with the ideology of the Soviet block.

Independence and ownership therefore result in little space for donor influence in the country. Even when the EPRDF was more compliant in the early 90s, still it was very clear about the areas where no compromise was acceptable. The desire to be free from conditionality was cited as the main reason for Ethiopia to decline an IMF loan, thus never becoming a 'program country'. This also explains the importance of new donors that not only allow the country to be more flexible in the choice of sources of financing but also typically impose less policy-related conditionality.

The attitude towards aid in Ethiopia is deeply shaped by this sentiment of independence and pride. In the words of an interviewee, "aid is a bitter medicine, not a sweet candy". As emerged in at least two interviews, it is a shame for Ethiopians to have to rely on foreign money to feed their population. This sentiment is clearly emerging from Meles Zenawi's millenium speech[25]:

> "While we can justly be proud of the fact that every generation of Ethiopians during those centuries have paid in blood to maintain our independence, we cannot but feel deeply insulted that at the dawn of new millennium ours is one of the poorest countries in the world. Over the course of our second millennium we have gone from being one of the most advanced nations on earth to that of being one of the poorest. Throughout this process we have not been colonized by any foreign nations and hence we have always been the

[25] Extract from Meles Zenawi's speech in occasion of the new Ethiopian millenium celebrations in 2007, available on www.nazret.com

> authors of our destiny, both our successes and failures. [...] A thousands years from now, when Ethiopians gather to welcome the fourth millennium, they shall say that the eve of the third millennium was the beginning of the end of dark ages in Ethiopia. They shall say that the eve of the third millennium was the beginning of Ethiopian renaissance."

All this is crucial in understanding why the Ethiopian government might not just treat aid and tax as substitutes in an opportunistic manner, as deeper historical and cultural aspects are at work here.

Political commitment and ambition

Linked to the issue of independence and national pride is the continued commitment of Ethiopian governments to development. While the EPRDF is the first Ethiopian government to make development its foremost objective, a closer look at the history as well as the interviews reveal that such a commitment was already present before. The discussion on the commitment to development clearly is not meant to overshadow events such as the Red Terror or the failure of the Imperial regime to tackle the 1973 famine that killed tens of thousands of people. It is rather one of many elements emerging from Ethiopian history, that is relevant for this research.

While the commitment to development under Haile Selassie has sometimes been described as a mere façade (see section 2.3.5), the Imperial development plans are likely to be the first ones in Africa and the government at the time has taken practical steps to increase revenues to fund a growing public administration (see section 2.3.3). In his speech at the League of Nations in 1936 the Emperor declared:

> "For 20 years past, either as Heir Apparent, Regent of the Empire, or as Emperor, I have never ceased to use all my efforts to bring my country the benefits of civilization [...]. "

As far as the Derg is concerned, a few interviews and informal conversations surprisingly pointed to an underlying commitment of the military government too. However, they argue, the military regime was not able to pursue this commitment for two reasons. First the Derg had no capacity to implement such a plan as it was largely composed by military forces with little understanding of economic policy. An interviewee also noted that the training for governemnt officials at that time was largely provided by the USSR and it was of lower quality than that provided by Americans under Haile Selassie. Secondly the Derg was too occupied with repressing the continuous challenges and opposition

it faced, thus not being able to engage in development. While this is only the view of a few Ethiopians, it was fairly consistent across interviewees with different backgrounds. What is written in history is that the Derg came to power with a socialist agenda based on land redistribution and modernization, as opposed to the exploitative feudal system. In addition the most serious attempt of the Derg to engage in a development plan was largely spoiled by the 1984 famine thus making its implementation very difficult, even assuming a genuine commitment to it.

However it is certainly under the EPRDF that the commitment to development became more prominent and central in the policy agenda. The TPLF's, and later EPRDF's, ideology has always been linked to the struggle for development in rural areas and indeed the leadership is highly committed to it, as confirmed in all interviews. The ambitious development plans of the last decade are largely in line with this commitment. Moreover the fact that the government is delivering at the local level (through the *woreda*-level decentralization and PBS) is helping tax compliance as the people start seeing a return for their tax payment, in what might be seen as an embryonic and implicit form of social contract.

The ambition, sometimes deemed excessive, and the commitment of the Ethiopian govenment deeply shape the aid-tax relation. As a top government official noted: "if more aid flows into the country, domestic resources do not have to decrease. Instead the project can expand. Aid and tax would only be treated as substitutes if a country does not have a vision", he argued, which is not the case for Ethiopia. On the contrary the fact that aid is available makes the ambitious government's plan possible because now the resources are available, matched with the domestic ones, to deliver it. Projects that would have taken a long time to be financed can now be actually realised with joint domestic and foreign resources. In other words, there seem to be excess demand for funds in Ethiopia. In this context aid and tax are complements rather than substitutes.

Taxation and aid: relative costs

The last underlying factor is the relative cost of tax and aid, which is sometimes cited as the reason for substitution. In particular, the argument goes, when governments have to decide how to finance their plans they will first choose aid and then fill the gap with as little tax as possible. This may be the result of a higher political cost of tax whereas aid is "free" money. This argumet is particularly ill grounded in the Ethiopian case, for at least two reasons.

First, I have shown that aid in Ethiopia is not 'free' and indeed conditionality and

aid dependence represent a heavy burden for leaders. Mengistu was wary his leadership appearing to be dependent on foreign actors, which would have undermined his image as a strong national leader (see section 2.4.2). This sentiment is even stronger under the EPRDF, especially after the 2001 TPLF crisis when foreign influence played a crucial role and was one of the areas of criticism towards the faction led by Meles (see section 2.5.3).

As far as conditionality is concerned, the interviews revealed that conditions on economic policy, including revenue performance, are not stringent nor really enforceable in Ethiopia. Indeed donors seem to be reluctant to leave the country or to stop aid because of economic conditions, although they may be the cause of delays in disbursment. So the burden is not as much attached to the aid that is given, but to the fact that it is not possible to get all the assistance that Ethiopia would want, and might partly be able to obtain, precisely because the cost attached to additional funds (in terms of conditionality) would be too high. This is of course true unless donors are willing to increase aid to Ethiopia for other reasons, such as geopolitical ones.

The issue of delayed disbursement brings us to another element often cited by interviewees: aid predictabilty. At least two top government officials noted explicitly that it is very difficult to make plans based on aid because it is an unpredictable and unreliable source of revenue. They argue that this became ever more clear after the 2005 elections. Another interviewee observed that it is dangerous to rely heavily on an unpredictable source of financing like aid for the huge development projects of Ethiopia. That, he argued, makes the country too vulnerable as these projects are of foremost importance. This links to the example of dams, widely cited as an example of projects that donors are not willing to fund though they are central in the government's strategy.

The second reason is related to the cost of raising tax. I asked questions about the political cost of increasing tax revenue in many interviews and the general consensus, both on the donors and government side, is that such a cost is not a big concern. First of all the government is acting mainly on expanding the tax base, including fighting evasion and expanding the tax net. Tax rates on the other hand have only been decreased under the EPRDF. This generates solid grounds for the government to argue that the increase in tax revenue is essentially fair and it is aimed at bringing everyone in the tax net to contribute their fair share. It is a matter of equality that everyone has to pay tax, and this reasoning is also being promoted with tax education campaigns and increased dialogue on taxation at the *kebele* level.

In addition the long tradition of centralization and statehood is playing an important

role. The Derg for example was able to extract revenues because of its authoritarian nature that the population would generally comply with, particularly after the experience of the Red Terror. Even during the Imperial regime, a top official noted, people in rural areas were used to paying tax. Failing to do so would be an act of dissent and, he explained, nobody would dare. Even if we have shown that landlords could exert some resistance in paying tax (see sections 2.3.1), peasants did not have the power to do so. This legacy clearly remained in today's Ethiopia, although the culture of compliance is not as rooted in urban areas. While the perceived high tax burden creates some discontent amongst businesses and individuals, it seems far from providing the basis for serious uprising particularly in the context of slow progress on democratization and pluralism. The government's view is that the fiscal burden is generally not a concern since the economy is growing fast and the full revenue potential is still not tapped.

Finally, the great political and economic importance of the EPRDF's development plan is at work again here. A high official in a major donor agency noted that the cost of increasing tax revenue is still much lower than the cost of not delivering the plan, and other interviewees have talked along these lines although less explicitely.

2.7 Conclusion

This chapter reviewed the Ethiopian fiscal history over the period 1960 - 2009, focussing on domestic revenues and aid. The analysis shows that in Ethiopia there does not seem to be a substitution effect between tax and aid, therefore answering the first research question (see section 5.1). This chapter shows that there are at least four underlying factors that make the existance of such a substitution effect particularly ill grounded in the case of Ethiopia. These underlying factors are supported by historical facts and episodes presented throughout the chapter. The analysis of the EPRDF period in particular shows how these factors, that are present throughout the whole period considered, are developed more consciously and clearly in the political discourse in the 2000s. By doing this, the analysis sheds light on the second research question.

Finally the analysis allows understanding the political economy underlying the observed variations in fiscal variables, answering the last question raised in section 5.1. Amongst others, the small contribution of agriculture to tax revenue emerges throughout the period; while trade has been a sector where substantial revenue has been generated. Thus the qualitative analysis also offers a solid basis for the econometric analysis, which is complementary to it. Particularly a number of issues remain to be explored with quantita-

tive tools, such as the estimation of the effect of agriculture and manufacturing shares on tax revenue mobilisation. In addition an econometric analysis is needed to assess whether a significant relation exists between aid and tax and particularly whether a positive relation can be supported by the data.

The analysis fills a gap in the literature by presenting a consistent and comprehensive reading of the Ethiopian economic history that is geared towards revenue mobilisation and aid. Moreover, by showing the importance of social, cultural and economic factors in defining the aid-tax relationship, it underlines the value of complementing a quantitative analysis with in depth qualitative elements. In this sense this chapter overcomes the limits of the existing economic literature that, by largely focussing on econometric aspects, fails to fully exploit the potential for a case study analysis.

Appendices

2.A Quotas and price controls

Quotas and price controls were widely used under the Derg as a surplus extraction mechanism. They can ultimately be seen as a way to finance government's plans since they are effectively a subsidy for urban consumption at the expense of producers. However they did not strictly represent a source of revenue for the government's budget, thus not showing up either in tax or non-tax revenue.

The central institution implementing quotas and price controls was the Agricultural Marketing Corporation (AMC), established in 1976. Partly as a response to increasing food prices and food shortages in urban areas, in 1978/79 the AMC introduced grain quotas. This imposed on peasants associations an obligation to transfer a part of their produce, namely 7%, to the government at a given price. This was a large proportion considering that the marketable output in Ethiopia was only 20% of the output of foodgrains (Griffin, 1992). However quotas were not set uniformly and their enforcement was quite arbitrary, therefore there are variations in estimates on how much was sold to the AMC in quotas (Eshetu Chole, 2004).

Cooperatives and state farms were forced to sell only through the AMC while private producers were required to only sell part of their output (estimated at 4%) to the AMC (Griffin, 1992; Clapham, 1987). This clearly created a further disincentive for joining cooperatives. Perhaps more indicative is the fact that private merchants were required to sell 50% of their grain purchases to the AMC (Eshetu Chole, 2004). The grains thus obtained were sold mostly to *kebeles*, state enterprises and the armed forces.

Surplus extraction was working through price controls, that were normally set by the AMC largely below market prices, by 50% for some major crops such as maize and teff (Griffin, 1992; Clapham, 1987). While the initial benefits of the land reform are not to be underestimated, there is no doubt that they were at least partly eroded by this system of quotas, besides the general impovrishment (Griffin, 1992). The exploitative system of the feudal era was now replaced by other forms surplus extraction from the peasantry.

Moreover the AMC retained control over fertilizer and it did discriminate against private peasants with respect to its price. As a result fertilizer was used a lot more in state farms relative to their share of the agricultural sector. All this made peasants ever more disenchanted and detached from the regime.

2.B Interviews

The full list of interviewees will not be disclosed, as agreed with those who took part in the interviews. However the following list indicated the main institutions involved in the consultation. Usually more than one person from each of the institutions above was interviewed, with at least one at the level of directors or heads of division. In addition, independent experts and academics took part in interviews.

- Addis Ababa University
- Department for International Development (UK)
- Ethiopian Development Research Institute
- Ethiopian Economics Association
- European Commission
- International Monetary Fund
- Ministry of Finance and Economic Development
- National Bank of Ethiopia
- Prime Ministers Office
- PBS Secretariat
- USAID
- World Bank, Ethiopia Office

Chapter 3

Aid and taxation: theory and evidence from Ethiopia

3.1 Introduction

This chapter provides an empirical analysis of the relation between aid and taxation in Ethiopia, using a unique dataset of 50 annual observations. This is a longer series than those used in most of the literature[1]. The main hypothesis explored is the existence of a crowding out effect of aid on tax revenues. In addition to the aid-tax relation, this chapter offers insights into the role of tax determinants such as the manufacturing sector, agriculture and trade.

I fully exploit the case study approach by complementing the econometric analysis with an in depth knowledge of the country specific context, grounded on the qualitative analysis of chapter 2. Not only the qualitative analysis allows the interpretation of the results in a more informed and relevant way. It also informs the econometric exercise by offering a deeper understanding of issues such as endogeneity and structural breaks. Given the limited attention given to the country context in the majority of the econometric literature on this topic, this approach represents a novelty.

Ethiopia has received increasing amounts of aid in recent years and it is often considered an 'aid darling'. While per capita aid is still below the African average, the share of aid to GDP is relatively high compared to Sub-Sarahan Africa[2]. Perhaps most importantly, Ethiopia has been identified by some donors as a focus country for increased aid flows in

[1] This is true for the literature focussing on case studies and using annual observations.
[2] Also see the introduction to this thesis in chapter 1.

coming years. For example DFID identified Ethiopia as one of its focus countries in its aid review of 2011, as it ranked in the first 5% of countries with the highest 'need-effectiveness' index (Department for International Development, 2011). At the same time tax revenues amount to only about 11% of GDP, a share that is well below the average for low income African countries (and for any other grouping of African countries, as shown in chapter 1). This situation coupled with the centrality of domestic revenue in financing the Growth and Transformation Plan (GTP, the current five-year development plan), makes the analysis of the relation between tax and aid central and relevant for the policy debate in Ethiopia. This analysis provides evidence for a positive effect of aid on tax revenues, that is mostly explained by the role of aid in building capacity at the national level.

To gain a deeper understanding on the aid-tax relation, this chapter explores the role of aid heterogeneity in terms of grants and loans. These are sometimes thought to have different effects due to the need for repayment for the latter, while the former would create fiscal space without giving rise to future liabilities (Gupta et al., 2004; Morrissey et al., 2006; Benedek et al., 2012). I find some support for this hypothsis in the long run, where loans have a stronger positive effect than grants. However there is still no evidence of a negative effect of grants in the long run, only of a weaker but still positive one. In the short run both grants and loans have a positive and significant effect.

Moreover by including other tax determinants in the analysis I find that manufacturing has a strong positive effect on tax revenues, probably due to its role as tax collector besides that of tax payer[3]. In addition agriculture does not appear to have a significant effect on aggregate tax, but it affects negatively domestic taxes. Trade has the expected positive effect. These results, while somewhat secondary with respect to those on aid, offer insights into the possible challenges and opportunities for a stronger tax revenue mobilisation, which is a top policy priority under the GTP.

Therefore this chapter is driven by the following three research questions, that are reported in order of priority:

- Is aid a disincentive to tax revenue mobilisation?
- Does aid heterogeneity matter (i.e. grants and loans)?
- What are the determinants of the tax share in Ethiopia?

[3]Firms collect collect taxes on wages and on consumption that are then transfered to the state.

3.2 Literature review

The literature on tax effort is based on the analysis of the determinants of the tax share (sometimes also referred to as tax effort), defined as total tax revenue collection as a share of GDP. It is mostly based on cross country analyses using data from international sources (e.g. Government Finance Statistics by the IMF or the World Development Indicators from the WB) to ensure comparability across countries. Part of this literature has been specifically focussed on the relation between tax and aid, without finding a consensus on the sign and significance of that effect.

The tax effort literature has its roots in the early studies conducted within the International Monetary Fund (Chelliah, 1971; Chelliah et al., 1975; Tait et al., 1979). They identify the core tax determinants that are still largely used in this literature today, and namely: mining share, trade openness (export + imports), GDP per capita and agricultural share. They use mainly cross-section estimation techniques often applied to averaged data on different periods. Typically a tax effort index is computed as the ratio between the actual tax share and the predicted one from the econometric model. This index is used for guidance in evaluating the fiscal performance of the countries considered. Tanzi (1992) largely confirms these early results by using cross section time series data for 88 countries. He finds that half the variation in the tax share can be attributed to those core variables, with the addition of the foreign debt share of GDP.

The most important theoretical contribution to this literature certainly is the article by Heller (Heller, 1975), that develops the framework largely used today in most of the literature (see appendix 3.A for a critical summary of it). Heller's framework originally focussed on variables from the public budget alone including tax, aid, borrowing, and expenditure. His empirical estimation of the model on cross section-time series data from 11 African countries underlines a negative effect of aid on tax effort. This framework is further tested in the fiscal response literature that includes mostly country case studies such as Franco-Rodriguez et al. (1998), Machado (2009), Mavrotas and Ouattara (2006), Franco-Rodriguez (2000), and Osei et al. (2003). The results on aid in this litreature are contrasting, with the former three articles finding a negative effect on tax revenue and the latter two a positive one[4].

The seminal work of Heller (1975) is further developed and expanded by Leuthold

[4]For a detailed review of fiscal response studies using the cointegrated VAR methodology, see chapter 4.

(1991) and Ghura (1998) to provide the theoretical basis for tax effort models, including also the quality of institutions and macroeconomic policies along with aid. The former study provides an empirical application on a panel of eight African countries observed over 9 years. The author disaggregates tax revenue in direct and indirect taxes and finds a positive effect of foreign grants on the former and a negative one on the latter. Ghura (1998) also focuses on African countries, again over a relatively short period between 1985 and 1996. He finds that aid has an adverse effect on tax revenue. However he underlines that endogeneity may be a problem if grants are directed towards less performing countries (therefore with higher needs) where the tax share is lower. The author also finds that corruption and macroeconomic policies are important determinants of the tax share. Mahdavi (2008) further expands the theoretical famework by adding new sets of explanatory variables related to demographics and labor force characteristics; administrative and enforcement costs; the macroeconomic environment; and the political environment and corruption. This rich specification is estimated using an unbalanced panel dataset of 43 developing countries observed over the period 1973-2002. The paper finds that aid still has a negative and significant (at the 10% level) effect even after all the other variables are included in the model.

Providing a more positive picture on aid, Gupta (2007) suggests that aid has a positive effect on tax revenue and that this result is even stronger for low income countries. He uses a bigger sample than previous studies, including 150 developing countries observed over 25 years. Stotsky and WoldeMariam (1997) focus particularly on the effect of IMF programs on tax effort in the receiving country, failing to find strong support for a beneficial effect. Other studies in this tradition have focussed also on corruption and the institutional environment (Bird et al., 2008; Imam and Jacobs, 2007), or on natural resources (Bornhorst et al., 2008). As far as other tax determinants are concerned, these studies generally find a negative effect of agricultural share in GDP, a positive effect of trade openness, a weak positive effect of manufacturing, and contrasting results on GDP per capita.

Some studies have looked specifically at aid heterogeneity, particularly disaggregating it in grants and loans. As underlined in Gupta et al. (2004), loans may have a positive effect on tax effort because of the need for repayment while grants may instead be expected to crowd out domestic revenue, therefore having an expected negative effect. This hypothesis is tested on a dataset of 107 low and middle income countries from 1970 to 2000. The results on the variables related to the tax base (namely agriculture, industry, trade and income) are in line with the literature. The hypothesis on grants and loans is confirmed

by finding the expected coefficients to be significant. Morrissey et al. (2006) estimated a similar specification using a comparable sample over the period 1975-2000 and confirmed these results: loans have a positive and significant effect on tax revenue, grants have a smaller negative and significant effect, so that the combined effect (when the two variables are combined in total aid) is a positive but non-significant coefficient. When lagged aid is used however, to account for possible endogeneity, the negative effect of grants becomes non-significant and total aid is found to have a positive effect on tax effort. Teera and Hudson (2004) reach a similar result, finding a positive but not significant result on the aid variable. By using interaction terms the authors also find that the importance of trade and manufacturing in influencing the tax share decreases as countries get richer.

More recently there has been a renewed interest in the estimation of the aid-tax relation, perhaps also sparked by a reflection on the existing evidence. In particular Carter (2013) provides a critical summary of the literature on the aid-tax relation underlining its methodological problems and other limitations. He provides new estimates, partly addressing the methodological concerns, that provide no evidence of a negative effect of aid on tax revenues perhaps also due to the increased attention of donors to domestic revenue mobilisation. Benedek et al. (2012) try to address specifically some of these concerns, particularly as regards endogeneity. They use a panel of 118 countries over 1980-2009 and a number of econometric methodologies including GMM. The results show a negative coefficient on grants that however is weakening over time, particularly when compared to the results of Gupta et al. (2004) that found a larger coefficient. They also estimate separate regressions for disaggregated tax types. While aid has a negative effect on most tax types, it has a positive relation with trade taxes. Clist and Morrissey (2011) use a large sample of developing countries and find that aid has a positive effect on tax revenue after the mid-80s when there appears to be a break in the relation. This break corresponds to a stronger emphasis on conditional lending in the international debate and it may indicate the success of conditionality in stimulating fiscal reforms. To address endogeneity, the authors use lagged aid (in addition to current aid in a separate specification) and find a positive result on both grants and loans after 1985. Aid lagged two years is also used as an instrument, yielding similar results. Mkandawire (2011) focuses on the effect of the colonial heritage on tax effort in a cross section of African countries, using averaged data over four-year intervals in the period 1984-2004. The author argues that the colonial status of African countries has implications in terms of taxation that can still be observed in today's tax systems. While aid it is not the focus of the analysis, it is still included

in the model and it is found to have a positive, although weak, effect on the tax share. This result is confirmed even when its lagged value is used as an instrument to account for endogeneity. Other recent papers largely confirm the results on the tax determinants related to the tax base, although they find no evidence of a significant relation between aid and taxation (Drummond et al., 2012; Le et al., 2012).

While cross country studies are prevalent in this literature, they also suffer from limitations due to the heterogeneity in the effect of aid amongst countries. Carter (2013) argues that due to this heterogeneity, estimates of averaged effects are unstable and they are of limited policy interest. One possible way forward indicated in the paper is the increased reliance on country case studies that can also include interviews with government officials. This is the approach adopted in this research and it is in this niche that I aim to contribute.

So far there are only few studies of tax effort that take a case study approach. Amongst these, Ezemenari et al. (2008) analyses Rwanda and it finds a small negative effect of aid. The paper also contributes to the literature by providing a theoretical framework alternative to Heller (1975) that is discussed in appendix 3.A. Other country studies have focussed mostly on the fiscal variables alone, following more the fiscal response tradition than the tax determinants literature (Hisali and Ddumba-Ssentamu, 2013; Martins, 2010; Osei et al., 2005; Bwire, 2013). They generally provide evidence of a positive effect of aid and they are reviewed in detail in chapter 4.

Contribution

This chapter contributes to the literature by providing a country study on Ethiopia, in a literature largely dominated by cross-country studies. I provide evidence for a positive relation between aid and taxation, therefore contributing to a debate that is still far from settled.

By complementing econometric evidence with qualitative information, I show the advantages of a case study approach. This is reinforced by in depth interviews of government and donor agencies officials that are specifically aimed at understanding the aid-tax relation. Since this approach is rather rare in the literature, it represents an original contribution aimed at overcoming the limits of the cross-country literature.

3.3 Data and empirical methodology

The data used to investigate the research questions outlined in section 3.1 is Ethiopian time series from 1960 to 2009[5]. The characteristics of this data, as well as the data generating environment are discussed in the next two sections. The last section describes the empirical model used to analyse this data and it discusses some econometric challenges.

3.3.1 The data

The Ethiopian dataset spans 50 years, from 1960 to 2009. By relying on 50 annual observations, this exercise can count on a larger sample than other country-level studies working with annual data. In a small sample context, even adding a few observations adds robustness to the results. This dataset is therefore a crucial asset for this analysis.

The dataset was compiled exclusively from national sources, and particularly from the National Accounts data originally compiled by the Ministry of Finance and Economic Development (MOFED). Using a single national source presents two advantages. First, it allows consistency in the data that cannot be fully ensured when mixing data sources. This is particularly the case of aid figures that may present huge discrepancies across different datasets, as discussed in the next paragraphs. Secondly the national data is used for policy making, thus making it more relevant than international datasets.

The use of national data is particularly important in the case of aid measures, namely grants and loans. The national figures used in this exercise consist only of aid that flows through the government budget (i.e. the Treasury). This includes, but it is not limited to, budget support. The use of this data for aid is not only sensible in terms of data consistency but it is also relevant to the research questions presented in section 3.1. Indeed the component of aid flowing to the budget is the closest substitute to tax revenue and it is therefore the one that is more likely represent a disincentive or substitution effect. Of course there are issues related to aid fungibility, but nonetheless it seems reasonable to consider this component of aid as the most relevant one for the analysis. This is reinforced by the fact that budget data is the one used by policymakers when taking fiscal decisions and it is the portion of aid that they are fully aware of.

The national aid figures are smaller than the ones reported by OECD-DAC[6]. This

[5]These are more specifically 1960/61 and 2009/2010, that are the Gregorian calendar years that correspond to the relevant Ethiopian years. The Ethiopian calendar is 7 years behind the Gregorian one and it starts in September.

[6]For example the grants figure is about a fourth of the corresponding OECD-DAC one.

discrepacy is due to items within grants that are not disbursed through the government system, mainly humanitarian and emergency aid that in Ethiopia can be rather substantial due to the constant threat of drought and famine. Moreover items that are not included in the budget grant figure are, for example, projects managed by donors and grants to NGOs.

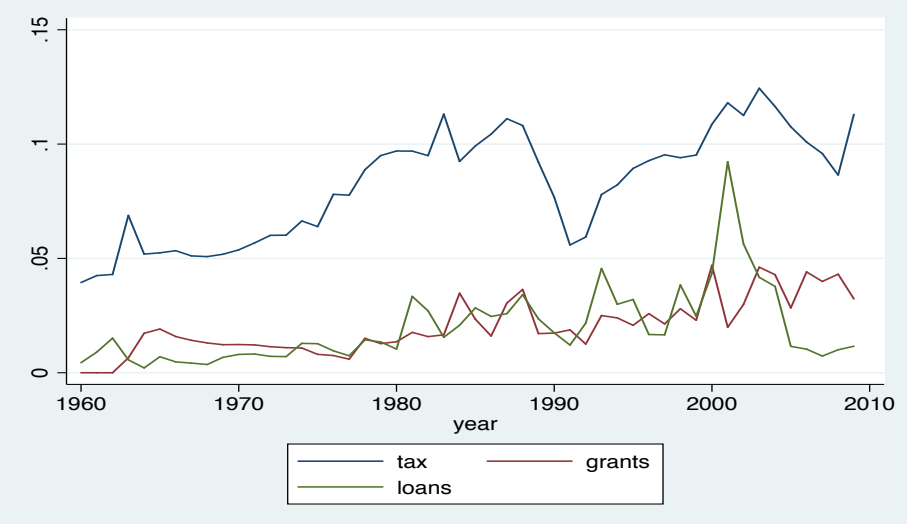
The national aid figure today is largely dominated by the Protection of Basic Services (PBS) project, described in chapter 2. Other programs disbursed through the Treasury are for example the Public Sector Capacity Building Program (PSCAP), the Productive Safety Net Program (PSNP) and other funds aimed at specific sectors such as infrastructure.

All variables are measured as a share of GDP, except for GDP per capita (log of constant GDP per capita) and the GDP gap (percentage deviation of GDP from trend). A summary of the variables used in this analysis is reported in appendix 3.B.

3.3.2 Ethiopian context and some descriptives

A full qualitative analysis of the Ethiopian context and a detailed description of the data is provided in chapter 2, therefore I will highlight here only a few elements that are relevent when carrying out the econometric exercise.

Figure 3.1: Plot of tax, grants and loans



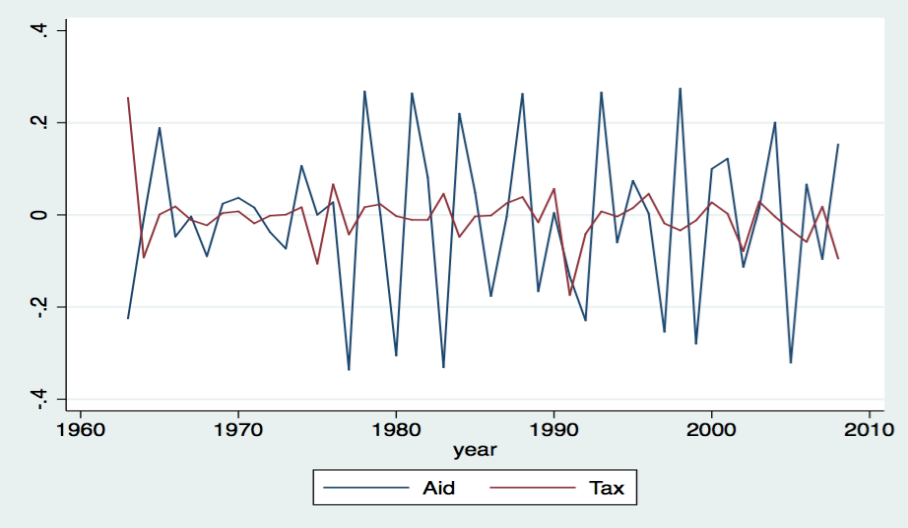
Note: all variables are expressed as a percentage of current GDP. Source: author's calculations using data from the Ministry of Finance and Economic Development.

The unique Ethiopian history of independence is translated in fiscal terms in the importance assigned to tax revenue mobilisation by all governments that have ruled Ethiopia over the period considered (see chapter 2 for a complete account).

As far as aid is concerned, Ethiopia has received budget aid throughout the whole period. Moreover foreign technical assistance has been provided to Ethiopia throughout the period, initially on the basis of the early sectoral and multi-year development plans of Haile Selassie. Even in the first imperial period, missions from the UN, the WB and the US provided advice in the field of taxation, amongst others (see chapter 2). Still today taxation is one of the areas of greatest agreement between the government and donors, in a relation that is often characterized by confrontation and contrasting views.

Figure 3.1 shows a plot of tax, grants and loans over the period, all measured as a share of GDP. The first message from the picture is that tax is a much larger source of revenue in the government's budget than grants and loans. Secondly the figure does not immediately suggest a negative relation between tax revenue and the aid variables. Moreover figure 3.2 reports the 3-year moving average of aid (aggregated grants and loans, for the sake of clarity) and tax, showing that the former is much more volatile than the latter thus making it a more unpredictable source of revenue.

Figure 3.2: Deviations from three-year moving average of tax and aid



Note: the figure reports deviations from the 3-years moving average of the grants and tax series in levels.
Source: author's calculations using data from the Ministry of Finance and Economic Development

3.3.3 Empirical framework and challenges

The Ethiopian time series are used to estimate a standard tax effort equation, stemming from the literature. Equation 3.1 is largely in line with other studies in this literature, where A is aid, later disaggregated in grants and loans, NT is non tax revenue, $Agri$ is the agriculture, $Manuf$ is manufacturing, $Trade$ is trade openness, and $GDPpc$ is GDP per capita. Appendix 3.B reports a more detailed descrition of these variables. Some

specifications add to these core variables a cycle variable (GDPgap) and dummies to reflect changes in regime.

$$T = b_0 + b_1 A + b_2 NT + b_3 Agri + b_4 Manuf + b_5 Trade + b_6 GDPpc \quad (3.1)$$

In equation 3.1 tax revenue is determined by variables that are proxy measures of components of the tax base, so the equation is largely in line with the cross-country tax effort literature. The theoretical basis for equation 3.1 is provided by Heller-type models, particularly as developed in the literature for example by Leuthold (1991) and Ghura (1998) (see section 3.2 and appendix 3.A for more details). The Heller-type fiscal response models focus largely on the effects of aid on spending, and revenue (including aid and tax) is required to finance spending. In Heller (1975) and other early papers aid does not enter the government utility function, but it is later introduced by Franco-Rodriguez et al. (1998) where aid and tax are allowed to affect differently government utility.

In a time series setting, variables may present trends. If the variables of interest move together in the long run, they may be cointegrated and this issue is discussed below. As far as short run dynamics are concerned, trends in the data become irrelevant since first differences are used in the empirical estimation. In particular equation 3.1 can be estimated using a cointegration model that allows separating the long run (LR) and short run (SR) effects. I use the two-step procedure suggested by Engle and Granger (1987). The Engle-Granger (EG) procedure requires the series to be integrated of the same order in levels (first step) and to be stationary in first difference (second step). To this end three tests for stationarity are used: the Augmented Dickey-Fuller test (*dfgls*), the Kwiatkowski-Phillips-Schmidt-Shin test (*kpss*), and the Clemente, Montanes, Reyes unit root test (*clem*). The last one in particular allows for the presence of up to two structural breaks[7] and it is therefore useful in the Ethiopian case where breaks may be expected in correspondence with regime changes[8]. It is important to remember however that the *clem* test is not a test for structural breaks as such but instead it only analyses the properties of a single series (Perron and Vogelsang, 1992). The results of the stationarity tests show that all

[7] The Zivot-Andrews test can only take into account one break (Zivot and Andrews, 1992).

[8] In the *clem* test the breaks are not imposed a priori but are estimated by the test. Using this test is particularly important because Dickey-Fuller style tests may confuse non-stationarity with structural breaks. In other words, in presence of structural breaks, the residuals will display a clear pattern and the classic unit root tests are not able to reject the null hypothesis of non-stationarity (Ghosh, 1999).

variables are I(1)[9]. They are reported and discussed in appendix 3.C.

The first step of the EG procedure identifies long run relations and it involves the variables in level, and more specifically as shares of GDP. Cointegration occurs when the relation between those non-stationary variables produces stationary residuals. If this is the case the series move together in time and they form a long-run equilibrium. The test for cointegration proposed by Engle and Granger is therefore esentially a stationarity test on the residuals similar to the Dickey-Fuller test[10]. Since this statistic does not follow the standard distribution, the MacKinnon critical values are used (MacKinnon, 2010). When residuals are not serially independent the test includes lags of the first difference of the residual and this version of the test is known as the Augmented Engle Granger (AEG) test.

The second step of the procedure identifies short run effects. Here the variables are included in first difference and they are therefore stationary, provided that they are I(1). The lagged residual from the first step is also included as an error correction term (ECT), indicating the adjustment to LR equilibrium.

As far as econometric challenges are concerned, two issues are of particular interest: endogeneity and structural breaks.

Endogeneity regards in particular the aid variables and the short run equations since LR cointegrating relation is superconsistent (Engle and Granger, 1987). Concerns are raised in the literature based on the idea that aid may be given to countries with higher needs, which may happen to be also those countries with a lower potential to raise taxes due to low levels of income. If this is the case, a negative spurious relation would indeed be observed between aid and tax. This however is a concern more in relation to cross-country studies than in a time series setting. In time series analysis endogeneity may stem from a possible detrimental effect of aid on domestic institutions that would therefore undermine the administrative basis for an effective fiscal system, resulting again in a spurious negative relation. Moreover aid flows may respond to government's decisions in terms of fiscal and economic policies, rewarding 'good' policies with increased financial assistance. If donors believe that increasing tax revenue is a 'good' policy and reward government that succeed in doing so, a spurious positive relation would occur. However this case seems

[9]The *grants* variable shows some stationarity in levels that however disappears in the *dfgls* test with one lag and when treated in conjunction with *loans* in the *aid* variable. The series is treated as I(1), also to ensure consistency with other variables.

[10]The test regresses the first difference of the residuals from the first step (LR) equation on the lagged level of these residuals, without a constant. The test statistic is a simple OLS t-statistic on the lagged residual.

particularly ill-grounded in the Ethiopian case. The following quote (Furtado and Smith, 2007) summarizes the argument for this, which is also exposed in more detail in chapter 2 and in section 3.5.1.

> "Changes in the level of donor assistance to Ethiopia have been driven overwhelmingly by political and geopolitical considerations [...]. These factors, rather than anything the government has consciously done to manage the aid agenda, have largely determined the level of aid inflows."

Endogeneity is discussed in detail in section 3.5.1 and an instrumental variable approach is proposed. Moreover the role of the institutional environment and governance are explicitely taken into account in section 3.4.3.

Turning to structural breaks, they are particularly expected in correspondence with the regime changes of 1974 and 1991. Two shift dummies are therefore included in the regressions presented in section 3.4 and this issue is explored in more detail in section 3.5.2. The dummies capture the Derg (1975-1990) and EPRDF (1991-2009) regimes, with the Imperial period (1960-1974) being excluded and thus representing the reference period. While breaks need to be taken into account, it is important to keep in mind the elements of continuity outlined in chapter 2. This is particularly relevant in the case of the administrative apparatus, that was largely inherited by successive regimes. While breaks can be expected in 1974 and 1991, section 3.5.2 explores the possibility of breaks other than these without however finding any evidence for it.

3.4 Results

This section presents the main results from the estimation of equation 3.1 using the Engle-Granger two step procedure. It is divided in two sections that report respectively the long run and short run results.

3.4.1 First step: the long run

Table 3.1 reports the long run (LR) results for different specifications of the empirical model, using all variables in levels[11]. Cointegration amongst these variables is crucial to ensure consistent estimates and to proceed to the next step of the Engle-Granger procedure. Therefore table 3.1 also includes the AEG test statistics at the bottom, for testing

[11] Mostly as a percentage of GDP, except GDP per capita and the GDP gap.

cointegration. These test statistics are to be compared with the MacKinnon critical values reported in table 3.2 and calculated using the Stata program module devised by Schaffer (2010). The null hypothesis is no cointegration, so rejection would provide evidence that the series are indeed cointegrated.

The first column of table 3.1 reports the full specification excluding regime dummies. However the AEG test statistic shows that this regression does not produce stationary residuals, therefore indicating the lack of cointegration. Since structural breaks may produce a pattern in the residuals, therefore making them non-stationary, column two includes regime dummies and with these the system is cointegrated. Indeed this regression passes the AEG test with 0 lags. Further lags in this case are not needed because the residuals do not show evidence of autocorrelation[12]. The regime dummies are therefore included in all remaining specifications.

The third column excludes the GDP gap variable over concerns of a possible built-in negative correlation with the dependent variable due to GDP being at the denominator of the tax share. This may also explain the negative coefficient on GDP gap that indicates a countercyclical behavior of tax revenue and that may be somewhat puzzling. Dropping the GDP gap has little impact on the results but it does allow grants to reach the 10% significance threshold. Note that this specification passes the cointegration test also when one lag is included, although zero lags would be sufficient since autocorrelation is rejected (see table 3.D.1 in appendix 3.D for autocorrelation tests on the LR equation). Given its superior cointegration properties and the little impact of dropping the potentially problematic GDPgap variable, column three represents the preferred specification[13].

Finally specifications 4 and 5 take multicollinearity into account by including alternatively *agri* and *trade* that are found to be the variables most affected by this issue (see appendix 3.E for a detailed analysis).

For all specifications a test for homoskedasticity (White and Breusch-Pagan tests) is run and it provides no evidence of a problem. The residuals also pass the normality tests. The R^2 for all LR equations is rather large, ranging from 0.86 to 0.92, which may be expected in presence of cointegration.

The results on the aid variables are consistently positive across specifications, with *loans* seemingly driving the positive effect of aggreagate aid as it is always significant

[12]Table 3.D.1 in appendix 3.D shows autocorrelation tests for the LR equation. They also show that autocorrelation disappears once regime dummies are included.

[13]This specification is used to compute the error correction term (ECT) for the second step of the Engle-Granger procedure and it is the basis of robustness checks.

Table 3.1: First step: LR results from tax equation

	(1)	(2)	(3)	(4)	(5)
grants	0.116	0.293	0.325*	0.325	0.248
	(0.52)	(1.65)	(1.78)	(1.48)	(1.56)
loans	0.215	0.305***	0.413***	0.428***	0.397***
	(1.62)	(2.81)	(4.31)	(3.74)	(4.24)
non-tax	0.260	0.194	0.163	0.304*	0.154
	(1.60)	(1.53)	(1.26)	(2.02)	(1.19)
agri	0.053	0.064	0.052	-0.038	
	(0.88)	(1.09)	(0.87)	(-0.56)	
manuf	1.366***	0.766**	0.736**	0.167	0.548**
	(4.00)	(2.48)	(2.31)	(0.48)	(2.35)
trade	0.087**	0.116***	0.144***		0.134***
	(2.09)	(3.29)	(4.34)		(4.32)
GDPpc	0.023	0.016	-0.007	0.039**	-0.011
	(1.09)	(0.79)	(-0.39)	(2.46)	(-0.66)
GDP gap	-0.028*	-0.025*			
	(-1.88)	(-1.91)			
Derg		0.019***	0.017***	0.017***	0.015***
		(4.10)	(3.61)	(3.06)	(3.58)
EPRDF		0.004	-0.003	0.003	-0.007
		(0.51)	(-0.42)	(0.41)	(-1.25)
Constant	-0.204	-0.152	0.012	-0.207	0.087
	(-1.41)	(-0.95)	(0.08)	(-1.34)	(0.80)
Observations	50	50	50	50	50
r2	0.86	0.92	0.91	0.87	0.91
Augmented Engle-Granger test for cointegration					
0 lags	-4.086	-6.363	-6.706	-6.687	-6.582
1 lag	-3.638	-5.734	-6.326	-5.884	-6.199
2 lags	-2.563	-4.745	-5.017	-4.708	-4.726

Note: t statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. All variables are included in levels, i.e. as a share of GDP except GDPpc and GDPgap. The dependent variable in all columns is the tax share.

except for column 1. *Grants* are significant only in specfication 3 at the 10% level. In particular a percentage point increase in the share of grants to GDP is associated with a 0.3 percentage points increase in the tax share, and the corresponding result for loans is 0.4 (specification 3). These findings are largely in line with the literature using the disaggregation between grants and loans, where the latter is found to have a stronger and positive effect.

Agriculture displays its expected negative coefficient only once multicollinearity is tackled, in specification 4, although it remains non-significant. Manufacturing and trade display the expected positive and significant coefficients which are confirmed in all specifications. In particular manufacturing has a large coefficient, implying that a percentage point increase in the manufacturing share of GDP is associated with a 0.7 increase in the tax share. This may be due to the fact that firms act as tax collectors, both for wage taxes and for indirect taxes. GDP per capita has a mostly positive coefficient that however is only significant in specification 4, suggesting that a 1% increase in GDP per capita increases the tax share by 0.04 percentage points.

Table 3.2: MacKinnon critical values

k (excl. constant)	10%	5%	1%
k=8	-5.328	-5.708	-6.478
k=9	-5.623	-6.011	-6.800
k=10	-5.907	-6.304	-7.112

Note: Critical values valid also for AEG with lags.

3.4.2 Second step: the short run

Having found cointegration in the first step, it is now possible to proceed to the second step (SR)[14]. The variables are now made stationary by first differencing[15].

Table 3.3 reports the SR results, starting in column 1 from the same specification as the LR one in column 3 of table 3.1. Let us note at the outset that overall the SR results are largely in line with the LR ones. Both aid variables still display positive coefficients in all specifications. Moreover in the short run both grants and loans are significant in all specifications, confirming that they both have a beneficial effect on tax effort. The effect of grants in the SR is larger in magnitude in all specifications. In particular, a percentage point increase in the share of grants in GDP is associated with a 0.4 percentage points

[14]Specification 3 of table 3.1 is used to compute the ECT.
[15]For stationarity test on the variables in first difference, see appendix 3.C.

increase in the tax share and the corresponding figure for loans is 0.25 (in the specification of column 1). Both coefficients are robust to changes in specification.

Column 2 considers a dynamic structure by including lags of grants and loans. The lags are not significant and their inclusion has only a small impact on the aid variables. Their coefficients are still positive although smaller than the contemporaneous ones, as it may be expected. In column 3 the GDP gap is brought in the equation, with a negative and significant coefficient consistent with the LR result. Although multicollinearity is not flagged as a problem (see appendix 3.E), columns 4 and 5 replicate the last two specifications of table 3.1 for completeness. Therefore *trade* and *agri* are included alternatively. Tests of autocorrelation and heteroskedasticity are carried out on all specifications and provide no evidence of the presence of these problems[16].

Trade is still significant and positive in all specifications, indicating that a percentage point increase in trade openness is associated with 0.2 percentage points increase in the tax share. Manufacturing in the short run is only significant at the 10% level in the last two specifications, while agriculture never reaches significance. This may imply that the structure of the economy, that is partly captured by these two variables, influences the tax share mostly in the long run. The regime dummies are not significant in any of the specifications, again indicating that they matter mostly in the LR. Finally, the error correction term (ECT) has the expected negative sign in all specifications and it indicates a quick adjustment to the LR equilibrium within one year.

3.4.3 The usual omitted 'suspect': governance

Governance is certainly the most obvious candidate as an omitted variable, that may result in endogenity. Indeed the relation between governance and taxation is well established in the literature on taxation and state building (OECD, 2008; Brautigam et al., 2008). Governance may also be thought to be related with aid, as donors can reasonably be worried about the effect of corruption and other bad administrative practices on aid spending.

Governance can be included using the International Country Risk Guide (ICRG) data on political risk which is available from 1985 to 2012. To the best of my knowledge, this is the longest available series of governance indicators. Given that its inclusion results in halving an already small sample, this variable was not included in the previous results. However it can be used to get a sense of the bias that its omission may induce. While the

[16] See autocorrelation tests for the SR equation in table 3.D.2, appendix 3.D.

Table 3.3: Short run results from tax equation (2nd step)

	(1)	(2)	(3)	(4)	(5)
non-tax	-0.043	-0.053	-0.005	0.060	-0.035
	(-0.34)	(-0.37)	(-0.04)	(0.38)	(-0.27)
grants	0.434***	0.491***	0.434***	0.186	0.426***
	(3.32)	(3.02)	(3.83)	(1.25)	(3.30)
L.grants		0.110			
		(0.72)			
loans	0.254***	0.242**	0.179**	0.176*	0.262***
	(2.98)	(2.64)	(2.34)	(1.70)	(3.16)
L.loans		0.016			
		(0.15)			
agri	0.066	0.047	-0.074	0.122	
	(0.60)	(0.40)	(-0.72)	(0.91)	
manuf	0.838	0.711	0.347	1.251*	0.595*
	(1.61)	(1.27)	(0.74)	(1.97)	(1.83)
trade	0.207***	0.212***	0.173***		0.210***
	(4.71)	(4.62)	(4.40)		(4.85)
GDPpc	-0.005	-0.005	0.057*	-0.001	0.007
	(-0.16)	(-0.16)	(1.86)	(-0.02)	(0.29)
Derg	0.001	0.001	0.003	0.000	0.002
	(0.45)	(0.35)	(1.15)	(0.14)	(0.59)
EPRDF	-0.002	-0.003	-0.002	0.001	-0.003
	(-0.86)	(-0.97)	(-0.85)	(0.38)	(-1.12)
ECT	-0.955***	-0.992***	-0.963***	-0.705***	-0.973***
	(-5.56)	(-5.02)	(-6.47)	(-3.48)	(-5.81)
GDP gap			-0.059***		
			(-3.68)		
Constant	0.000	0.000	-0.002	0.001	-0.000
	(0.06)	(0.10)	(-0.79)	(0.33)	(-0.18)
Obs.	49	48	49	49	49
r2	0.61	0.62	0.71	0.38	0.60

Note: t statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. All variables are included in first difference an the dependent variable is the tax share in all columns.

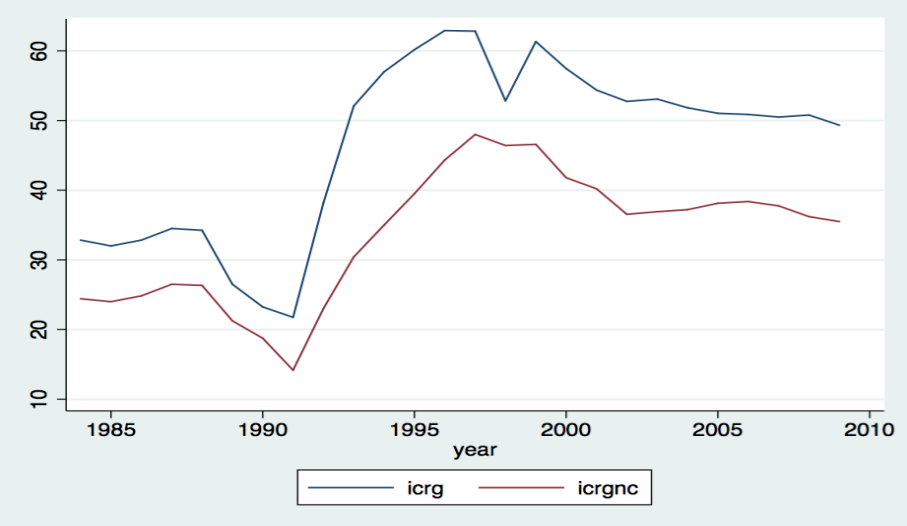
resulting sample is smaller, it is still sufficient to obtain indicative estimates.

The ICRG political risk variable is a measure of governance comprising the following 12 indicators (weights in brackets): government stability (12), socioeconomic conditions (12), investment profile (12), internal conflict (12), external conflict (12), corruption (6), military in politics (6), religious tensions (6), law and order (6), ethnic tensions (6), democratic accountability (6), bureaucracy quality (4). The maximum rating for each country is 100, that indicates very low political risk and the highest level of governance.

In particular two different variables from the ICRG dataset are used: the full indicator (*icrg*) and the indicator excluding the two conflict components (*icrgnc*). These indicators are rescaled to take values from 0 to 1. The reason for excluding conflict is that it may not be strictly related to governance and it may have a different effect on tax than governance. For instance if taxes are increased at times of war because of increased financing needs, a higher ICRG indicator (i.e. less conflict) would be associated with a lower tax share. On the contrary the effect of governance on tax postulated in the literature is generally positive: better working institutions are better able to collect taxes and to overcome compliance problems. Having established in theory the relation between governance and taxation, endogeneity may arise when the former is also related with aid.

Figure 3.3 plots these two series and shows that indeed there is some variability in the ICRG indicators for Ethiopia over the period considered.

Figure 3.3: Plot of ICRG indicators



Source: International Country Risk Guide

Table 3.4 reports estimates using the full sample in column 1, to allow comparison with previous results. Column 2 reports the same estimates, still excluding the ICRG

indicators, on the period from 1985 onwards to allow a direct comparison in the same time period. Note that only one shift dummy is included in this sub-sample since only one regime change occurs. Columns 3 and 4 report the results of two regressions including respectively *icrg* and *icrgnc*.

Both governance variables display the expected positive and significant coefficients. This result confirms the importance of governance in determining the tax share. Most importantly however the results on aid variables are only marginally changed by the inclusion of governance. The coefficients on grants and loans remain significant and of comparable magnitude with those of column 2, thus confirming the existence of a positive effect. In the case of loans the new estimates including ICRG data are both smaller, thus suggesting the presence of a small positive bias. However in the case of grants it is not clear whether the small bias would be positive (as indicated when using *icrg*) or negative (as when including *icrg*).

It is worth noting that the positive effect of the Derg dummy becomes significant when the governance variables are included. This is due to a purely statistical effect, where the dummy captures the jump shown in figure 3.3 while the coefficients on governance capture variations within the periods (i.e. Derg and EPRDF).

A further confirmation of the existence of a small positive bias due to the omission of governance can be obtained using the following standard formula (Greene, 2008), applied to the aggregate aid figure.

$$E[b|x,z] = \beta + \frac{cov(x,z)}{var(z)}\gamma \tag{3.2}$$

In equation 3.2, b is the estimated coefficient, x is the potentially endogenous variable (i.e. aid), z is the omitted variable (i.e. governance) and γ is the coefficient that z would have if it was not omitted. So the sign of the bias is determined by two elements: the effect of z on the dependent variable and the sign of the covariance between the x and z. All these variables are available from the previous estimation and using ICRG data. For the sake of simplicity the calculation is done using the aggregate aid figure, also considering that the bias on the disaggregated grants and loans coefficients is already clear from table 3.4. The true coefficient of aid and the size of the bias can therefore be calculated by substituting as follows:

$$b = \beta + \frac{0.093}{160.004}(0.001) \tag{3.3}$$

The equation provides further evidence on the presence of a small and positive bias (i.e. the second term on the LHS) due to the omission of governance, consistent with the

Table 3.4: SR results with governance

	(1) Full sample	(2) 1985-on	(3) 1985-on	(4) 1985-on
non-tax	-0.043	0.011	-0.099	-0.072
	(-0.34)	(0.06)	(-0.75)	(-0.49)
grants	0.434***	0.469**	0.424***	0.478***
	(3.32)	(2.82)	(3.42)	(3.46)
loans	0.254***	0.350***	0.314***	0.314***
	(2.98)	(3.28)	(3.94)	(3.50)
agri	0.066	-0.077	0.059	0.062
	(0.60)	(-0.49)	(0.49)	(0.44)
manuf	0.838	0.081	0.691	0.752
	(1.61)	(0.11)	(1.25)	(1.17)
trade	0.207***	0.180***	0.176***	0.191***
	(4.71)	(3.28)	(4.33)	(4.16)
GDPpc	-0.005	0.036	-0.004	-0.003
	(-0.16)	(0.91)	(-0.14)	(-0.09)
Derg	0.001	0.006	0.016***	0.013**
	(0.45)	(1.06)	(3.28)	(2.45)
EPRDF	-0.002	.	.	.
	(-0.86)	.	.	.
ECT	-0.955***	-0.830**	-0.821***	-0.953***
	(-5.56)	(-2.94)	(-3.92)	(-3.98)
icrg			0.060***	
			(3.64)	
icrgnc				0.062**
				(2.77)
Constant	0.000	-0.004	-0.033***	-0.025***
	(0.06)	(-1.33)	(-4.01)	(-3.15)
Observations	49	25	25	25
r2	0.61	0.65	0.82	0.77

Note: t statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. All variables are included in first difference and the dependent variable is the tax share in all columns. The first column uses the full sample, the others use a sub-sample starting in 1985.

results in table 3.4. However this bias is negligible and it does not substantially affect the aid estimates. Indeed the results are essentially unaltered when the ICRG indicators are included in the equation.

A caveat of this analysis using ICRG data is that any result only refer to the period 1985-2009 and they may therefore not be fully generalizable to the whole period.

3.5 Robustness

Having presented the main results, this section checks their robustness to a number of econometric and data issues. Despite having taken into account the effect of governance as a possible omitted factor in section 3.4, endogeneity remains a possible econometric issue and it is therefore discussed in further detail in section (3.5.1). In addition structural breaks may also be a concern, given the presence of three different political regimes throughout the period. While it is reasonable to assume breaks in correspondence of regime changes, tests are also performed to check other possible breaks in the relation (section 3.5.2). Finally, section 3.5.3 checks the robustness of the results to the choice of using variables as a share of GDP and it presents results using logs instead.

Additional problems that may affect the results are influential observations and non-linearities. The former in particular may be an issue in presence of exceptional events that indeed occurred in Ethiopia in the period considered, such as droughts and famines. These events may cause disruptions in tax payments and large inflows of aid, therefore potentially affecting the relation. This issue however does not appear to determine the results, that are robust to dropping the observations that are potentially problematic (for more details see results and discussion in appendix 3.F).

The second problem may rise from the possible non-linearities in the aid-tax relation. To tackle this, quadratic terms are included in both in the LR and SR equations. Only mild evidence is found of a decreasing effect of grants, which would be consistent with the idea that the marginal benefit of aid is decreasing with the amount of aid. These results are reported in appendix 3.G.

The remainder of this section focuses specifically on endogenity and structural breaks.

3.5.1 Endogeneity and reverse causality

The endogeneity of aid is a common concern in the tax effort literature, as discussed in sections 3.2 and 3.3. In the cointegration framework endogeneity would be a problem only in the SR, since the LR equilibrium relation is characterized by superconsistency

(Engle and Granger, 1987). In presence of endogeneity, the SR coefficients could pick up spurious effects due to omitted variables or simple correlations in which causality cannot be established.

A common way to test for endogeneity in a time series setting is the Granger causality test (Granger, 1969). When applied to the Ethiopian series, with particular attention to the aid variables, the test shows that both grants and loans Granger-cause tax. However this test suffers from several limitations such as its purely statistical nature, therefore ignoring suggestions from economic theory, and its focus on the temporal dimension only. Appendix 3.H reports the test results and it discusses them.

This section starts by discussing possible instrumenting strategies and by providing 2SLS results. It continues by exploring the nature of endogeneity in the specific case of Ethiopia, using qualitative information including interviews to donors and government officials.

IV estimation

Finding a valid instrumenting strategy for aid is generally a difficult task, and it is an even harder one in a time series setting. Not only the proposed instrument should be measured with available data for the whole period considered, but also it is required to vary in time. This difficulty is further exacerbated when the analysis focuses on a developing country, where data availability is usually more problematic and relatively long time series are rare.

Given this difficulty in finding an appropriate instrument for aid, the literature commonly uses its lagged value to decrease concerns over endogeneity (Gupta et al., 2004; Morrissey et al., 2006; Clist and Morrissey, 2011; Mkandawire, 2011). This is also the main instrumenting strategy used here and particularly two lags are used as instruments.

Table 3.5 reports the results of the first stage and second stage regressions respectively in the first two and last two columns. As regards the first stage, the results show clearly that the instruments are better fit to explain grants than loans. In the case of loans the proposed instruments may not be associated with the problem variable, therefore violating one of the standard conditions for a relevant IV, (Cameron and Trivedi, 2009). The weaker the association of the IV with the problem variable, the weaker the identification.

Instruments that are marginally relevant are weak instruments and they make estimation much less precise, thus inflating standard errors and resulting in less satisfactory t-statistics. The partial R^2 provides a test for weak instruments as it captures the explanatory power of the instruments once all other variables are controlled for. The partial

Table 3.5: IV estimation with lagged grants and loans

	(1) 1st stage	(2) 1st stage	(3) 2nd stage-IV	(4) 2nd stage-IV
non-tax	0.258*	-0.163	-0.090	-0.052
	(1.99)	(-0.63)	(-0.66)	(-0.45)
grants		0.109	0.378	0.545***
		(0.34)	(1.56)	(3.28)
loans	0.031		-0.035	0.274***
	(0.34)		(-0.12)	(3.55)
agri	-0.196*	0.223	0.131	0.068
	(-1.75)	(1.02)	(1.04)	(0.69)
manuf	-0.354	1.416	1.306*	0.810*
	(-0.66)	(1.42)	(1.88)	(1.73)
trade	-0.087**	-0.070	0.180***	0.226***
	(-2.19)	(-0.89)	(2.84)	(5.30)
GDPpc	0.037	-0.080	-0.018	-0.004
	(1.15)	(-1.34)	(-0.55)	(-0.17)
Derg	0.001	0.000	0.001	0.001
	(0.26)	(0.03)	(0.19)	(0.20)
EPRDF	0.000	0.004	-0.002	-0.004
	(0.14)	(0.69)	(-0.56)	(-1.35)
L.grants	-0.461***	0.409		
	(-3.01)	(1.28)		
L.loans	-0.212**	-0.164		
	(-2.36)	(-0.91)		
L2.grants	-0.308**	0.100		
	(-2.14)	(0.35)		
L2.loans	0.164*	-0.267		
	(1.78)	(-1.51)		
ECT			-0.848***	-1.019***
			(-3.54)	(-6.32)
Constant	-0.000	0.001	0.001	0.001
	(-0.15)	(0.15)	(0.46)	(0.42)
Observations	47	47	47	47
r2	0.58	0.25	0.49	0.61

Note: t statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The first column reports results for the first stage regression on grants; the second one is the first stage regression with loans as a dependent variable; the third reports the second stage 2SLS regression where both aid variables are instrumented; the fourth column reports the 2SLS results when only grants is instrumented. All variables are included in first difference.

R^2 in the grants equation is 0.3 whereas for the loans equation is 0.1, thus confirming the low validity and relevance of the IV in the latter case. A more formal test for weak instruments (Stock and Yogo, 2005) confirms that the proposed instruments are weak for loans but not for grants[17].

Having established that the IV may not be valid for loans, columns three and four instrument respectively both variables and only grants, for which the IV appears valid. When both variables are instrumented, loans becomes largely non-significant with a large standard error (0.3, almost ten times larger than the coefficient) which could be expected. The coefficient on grants is positive but also non-significant, with a more precise estimate and a smaller standard error (0.24). When only grants is instruemnted (column 4), its coefficient is positive and significant with a magnitude that is relatively similar to the OLS estimate of 0.434[18].

The 2SLS results therefore provide evidence for the robustness of the positive coefficient of grants in the SR to endogeneity, while the IV estimates are not satisfactory for loans. However the Granger causality test did not flag any concern for loans while it indicated the possibility of reverse causality for grants (see appendix 3.H). The combined evidence therefore suggests that estimates are fairly robust to endogeneity. Biases may occur, but they appear to be small. However it should be noted that the instruments used here suffer from limitations on validity, and therefore the issue of endogeneity is not fully tackled. Chapter 4 will address these concerns more systematically.

The IV estimates can be compared to the OLS ones (those showed in table 3.3) to assess the extent of endogeneity. Two tests are performed and they provide consistent results: the Hausman test and the Durbin-Wu-Hausman test[19]. The former finds that the difference in coefficients between the two methods is not systematic (p-value: 0.99), therefore supporting the OLS estimates on efficiency grounds. The latter confirms this result, failing to reject the null hypothesis of exogeneity of the aid variables with p-values of 0.29 (Durbin score chi2) and 0.41 (Wu-Hausman F statistic).

[17]The hypothesis of weak instruments cannot be rejected for the former but it can for the latter at the 10% level, with F-statistic of 1.5 for loans and 8.7 for grants, to be compared with a 10% critical value of 7.5.

[18]The coefficient estimated with 2SLS is larger than the OLS one, thus indicating a small negative bias. While the IV estimate should not be taken as a precise point estimate, it may be compared with the results obtained when including governance in section 3.4.3. As far as grants are concerned, the exercise with ICRG data did not show a clear indication on the sign of the bias. Therefore the ICRG and IV results are largely consistent. The fact that all estimates (OLS, IV and including ICRG) are of comparable in magnitude supports the robustness of a positive effect of grants.

[19]The first test requires homoskedasticity while the second one allows for heteroskedasticity.

Qualitative evidence

In addition to econometric tests and techniques, qualitative evidence may help explaining the nature of endogeneity in Ethiopia and assessing the extent to which it is indeed a problem. This qualitative analysis is supported by interviews to government officials and donor agencies, therefore allowing for great insight into the working of the aid-tax relation in the Ethiopian context.

Chapter 2 shows that Ethiopia since 1960 has received aid for reasons largely other than economic ones. To the extent that aid is driven by political and strategic reasons in donor countries, it is exogenous to the Ethiopian government's decision making process that determines the tax share conditional on a number of variables.

This discussion does not aim at arguing that donors disburse money regardless of the country level conditions. Clearly they want to see 'value for money' and thus they do care about basic economic indicators as well as fiscal policy. However conditionality in Ethiopia is rather mild, due to weak enforceability and a relatively low bargaining power of donors (see chapter 2 for a full discussion on this). Strong ownership and leadership on the government's side means that policy objectives and conditions need to be in line with its priorities to be acceptable. This is largely recognised by donors as well, as confirmed in the interviews. So for example fiscal discipline and relatively low corruption are part of the Ethiopian institutional tradition and not a response to donor preferences, perhaps with the aim of receiving more aid. This situation is not particularly surprising in a country with a long institutional tradition and a history of independence from colonial powers.

An example of mild conditionality is PBS, which indeed does condition aid on service delivery, something of which the government is very enthusiastic about. Chapter 2 shows that this focus on services not only is in line with government's objectives, but also it allows it to gain legitimacy and popularity amongst citizens as well as largely wiping off the discussion table broader economic policies.

Still using the example of PBS, let us consider conditionality on the revenue side. In principle PBS imposes additionality, as foreign funds have to be matched by government resources. I asked donors about the enforcement of this principle and in particular what would happen if the government does not adhere to it. They confirmed that there is no actual way to enforce additionality. However this has not been a problem in Ethiopia so far, as the Government has consistently overperformed on the revenue targets. Indeed increasing revenue is first and foremost a priority of the government thus making strict conditionality on revenue irrelevant.

As far as economic factors are concerned, they do not seem to influence aid either. For example Ethiopia has experienced very high inflation in the past 5 years and while donors have been critical of this, aid has increased. Similarly the case of liberalizations is emblematic (see chapter 2 for more details). Although the governemnt has systematically refused to open up to donors requests in this area, there has been no consequence on aid flows.

So aid does not seem to be driven by economic factors in Ethiopia. It is interesting that even the most technical of the donor agencies involved in the interviews confirmed that it is indeed political and stretegic reasons that really matter in Ethiopia, while donors can always turn a blind eye on economic issues. Ethiopia benefits from a strategic geographical position that allows easy access to the Middle East as well as a good base for communications and military operations. For example the American Kagnew communications station, inaugurated well before the period considered here, was a crucial listening post in the Korean war, World War Two and during the Cold War (see chapter 2 and Wrong (2005)). The strategic importance of Ethiopia was then reinforced during the Cold War and as a result of the increased terrorist threat following the attacks to US embassies in Nairobi and Dar es Salaam in 1998 and the New York attacks of September 11^{th} 2001.

To the strategic considerations is to be added the fact that Ethiopia is home to millions of African poor, being a large country and still one of the poorest in the world. All this explains why donors are reluctant to leave Ethiopia even when economic and political conditions deteriorate.

One relevant example is the aftermath of the 2005 elections. While many donors pointed to violations of human rights as well as irregularities in the election process, aid was only temporarily suspended. One immediate 'punishment' was the end of budget support that however was promptly replaced by PBS. Under this project (PBS is a project although some similarities exist with tied budget support) aid could not only be restored quickly after the interruption, but also it increased in the following years.

In conclusion, domestic economic and political factors do not seem to play a role in determining variations in aid flows. The qualitative elements discussed here indeed suggest that aid in Ethiopia seems to be only weakly or not at all determined by economic or political governance (thus potentially raising concerns about the omitted variable bias) or by the tax share itself (thus resulting in reverse causality). Instead it is more plausible to explain aid flows with the political and strategic needs of donor countries, therefore making them exogenous to the domestic decision making process.

3.5.2 Structural breaks

As anticipated in section 3.3, Ethiopian history over the period considered suggests the presence of two obvious breaks in correspondence to the changes of regime in 1974 and 1991. These 'expected' breaks are already taken into account in the main exercise (section 3.4) and this section justifies their inclusion. Moreover it explores them in more detail by using interaction terms between the regime dummies and other explanatory variables. In addition to the regime changes, other events may result in breaks. For example Clist and Morrissey (2011) provide cross-country evidence for a break in the aid-tax relation in the mid-80s, coinciding with the increased adoption of structural adjustment programs and conditional aid. The CUSUM and CUSUMSQ tests[20] explore the possibility of additional breaks by looking at the data rather than the context information. However no additional breaks are found except the change of regime in 1991 in the LR, and no breaks are detected in the SR. The positive results on the aid variables are largely confirmed.

Finally rolling and recursive estimation techniques[21] are used to check for parameter stability. While the parameter on grants is shown to be consistently positive both in the SR and the LR, the recursive and rolling estimations do provide negative coefficients for loans. However after the mid-80s, and surely during the EPRDF period, the estimated loans coefficients are consistently positive[22]. While these results certainly raise concerns about parameter stability, they are to be taken with caution since they are based on sub-samples of an already small sample.

The small sample also prevents a meaningful application of the Chow test[23], that is commonly used to test for the presence of breaks. Since the test requires estimation on the sub-samples, it would rely on estimates calculated on 15, 16 and 19 observations respectively for the Imperial, Derg and EPRDF periods. Besides technical concerns related to the small sub-samples, such few observations are not really compatible with the long run nature of the first step equation.

[20] The former plots the time sequence of the cumulative sum of residuals divided by the standard error of the regression. The latter plots the cumulative sum of squared residuals rescaled by the partial sum of the residual sum of squares so the last value will always be one.

[21] The recursive technique estimates the equation on the first 15 years and it then repeats the estimation gradually adding each year until the full sample is included. The recursive parameter typically shows instability in the first years, estimated with fewer observations, before stabilizing. The rolling method estimates the equation over a 15 year window starting from the first 15 years (i.e. 1960 to 1974) then progressively rolling that window year by year over the sample.

[22] While it would be tempting to take this as evidence in favor of the Clist and Morrissey (2011) argument, Ethiopia only started structural adjustment in the early 90s.

[23] The Chow test tests the null hypothesis of no structural breaks by comparing the residual sum of squares of the restricted model (i.e. whole sample) against unrestricted models estimated on the separate sub-samples.

Figure 3.4: CUSUM graph (LR)

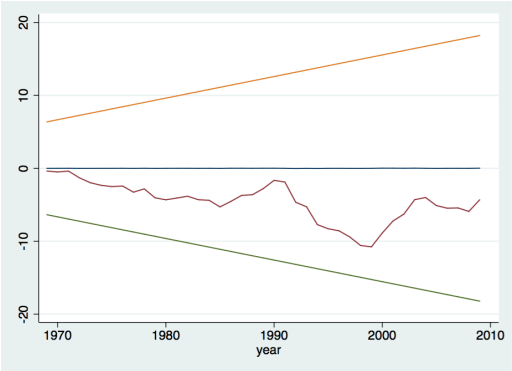
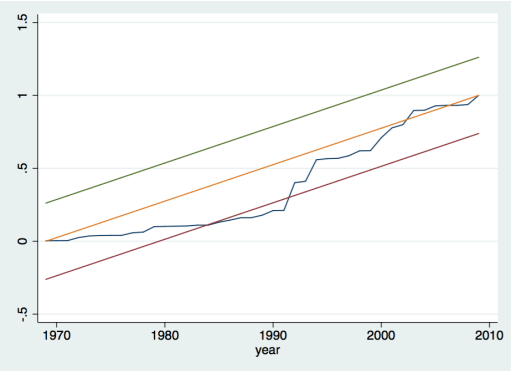


Figure 3.5: CUSUMSQ graph (LR)



The following sections look at the details on robustness to structural breaks respectively for the LR and SR. While they show that structural breaks need to be taken into account, which is done in the econometric exercise, they also support the robustness of the main results and particularly for grants. This may be due to the large degree of continuity in Ethiopian culture of power an administrative apparatus, despite the regime changes (see section 3.3 and chapter 2 for a more detailed discussion).

1st step: the long run

A first symptom of structural breaks in the LR equation is the presence of autocorrelation in the residuals when the regime dummies are not included. Since structural breaks result in a clear pattern in the residuals, they may induce autocorrelation. Indeed when regime dummies are included the problem disappears (see results of autocorrelation tests in appendix 3.D).

The CUSUMSQ tests confirm that the second regime shift in particular, from the Derg to the EPRDF, produces a break in the late 80s/early 90s[24]. Figures 3.4 and 3.5 show the results of the two tests, with 95% confidence bands. The exit of the residual plot from those bands is taken as evidence of the presence of structural breaks. The calculation of cumulated residuals only starts at time $k+1$ where k is the number of parameters to be estimated in the equation. It may therefore be that the failure to detect the first break in 1974 is due to the fact that only a few years of the Haile Selassie empire are included in the calculation. No other breaks are detected by these tests.

Having confirmed that structural breaks are corresponding to the expected dates (i.e. to regime changes), they can be taken into account using dummies both as independent

[24]This break is however not detected in the CUSUM test.

variables and in interaction terms. The latter in particular is useful to identify the effect of breaks on the parameters of interest, namley those on the aid variables[25]. Table 3.6 reports the LR regression without and with regime shift dummies respectively in columns 1 and 2. Columns 3 and 4 add the interaction terms with the aid variables, respectively without and with the shift dummies. In columns 3 and 4 therefore the parameter on the variable refers to the reference period, i.e. Haile Selassie's regime, while the coefficients for other regimes are obtained by summing the coefficients on the original variable and on the relevant interaction term.

The results in table 3.6 show that both grants and loans seem to have negative, though largely non-significant coefficients in the first period and positive ones later. While loans and its interaction terms are non-significant individually, they are jointly significant (F(3, 38) = 5.25, p-value: 0.004). However this is not the case for grants and its interaction terms, for which the test of joint significance cannot reject the null (F(3, 38) = 1.07, p-value: 0.373).

Figure 3.6: Grant rolling estimates (LR)

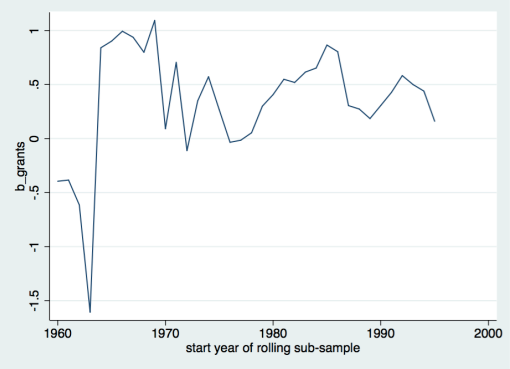


Figure 3.7: Loan rolling estimates (LR)

Having identified the presence of structural breaks, parameter stability is assessed across the period using a specification that includes regime dummies[26]. Rolling estimates are obtained using rolling 15-years windows starting from the period 1960-1974. The year on the horizontal axis is therefore the starting year of the rolling estimation. These estimates are then plotted in figures 3.6 and 3.7 to assess the stability of parameters. While informative, these results are to be taken with caution since each estimate is only relying on 15 observations. Both parameters show a period of instability at the beginning

[25] This exercise is repeated for all variables in the model but the results are not reported for simplicity. The Derg dummy and its interaction terms are generally the most significant ones. The previous results are largely confirmed.

[26] The specification used as a basis for rolling and recursive estimation corresponds to column 3 in table 3.1.

Table 3.6: LR equation with structural breaks

	(1)	(2)	(3)	(4)
grants	0.199	0.325*	-0.131	0.145
	(0.90)	(1.78)	(-0.39)	(0.31)
loans	0.332***	0.413***	-0.436	-0.031
	(2.74)	(4.31)	(-0.83)	(-0.04)
non-tax	0.222	0.163	0.085	0.249*
	(1.34)	(1.26)	(0.55)	(1.71)
agri	0.081	0.052	0.104	0.036
	(1.36)	(0.87)	(1.68)	(0.54)
manuf	1.480***	0.736**	1.092***	0.792**
	(4.27)	(2.31)	(3.00)	(2.33)
trade	0.109**	0.144***	0.131***	0.131***
	(2.67)	(4.34)	(3.36)	(3.71)
GDPpc	0.006	-0.007	0.011	-0.008
	(0.30)	(-0.39)	(0.54)	(-0.39)
Derg		0.017***		0.017
		(3.61)		(1.55)
EPRDF		-0.003		-0.017
		(-0.42)		(-1.23)
grants_derg			0.807	0.014
			(1.56)	(0.03)
grants_eprdf			0.309	0.333
			(0.81)	(0.67)
loans_derg			0.879	0.095
			(1.54)	(0.12)
loans_eprdf			0.851	0.456
			(1.59)	(0.62)
Constant	-0.115	0.012	-0.146	0.033
	(-0.81)	(0.08)	(-0.94)	(0.21)
Observations	50	50	50	50
r2	0.85	0.91	0.90	0.92

Note: t statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. All variables are included in levels, i.e. as a share of GDP except GDPpc and GDPgap. The dependent variable is the tax share.

of the period. The coefficient on grants then settles on mostly positive values, while the one on loans becomes positive from the late 80s.

The plots of coefficients obtained using recursive estimation (not reported here for simplicity) are largely consistent with the results from the rolling estimation.

2nd step: the short run

Contrary to the LR case, in the SR no autocorerlation is detected regardless of whether the regime dummies are included or not. This suggests that structural breaks are not present in the SR and indeed the CUSUM and CUSUMSQ tests confirm it. The test results, reported in figures 3.8 and 3.9, show no evidence of structural breaks in the short run as the plotted residuals lie inside the 95% confidence interval.

Although the analysis of residuals offers no evidence of the presence of structural breaks, it may still be useful to check for the effect of interaction terms between regime dummies and the aid variables[27]. Table 3.7 reports the results using the regime dummies both as independent variables and in interactions terms. The coefficient on grants is positive in all periods, generally with a larger magnitude in the Haile Selassie period. Loans instead have a negative coefficient in the first period that turns positive in the remaining two periods, with the EPRDF interaction term being always significant at the 10% level. A test of joint significance of grants and loans and their respective interaction terms shows that they are both jointly significant[28].

Parameter stability is explored using rolling estimation (in this section) and recursive estimates (results not reported for simplicity) on a 15 years window[29]. Consistently with LR results, the coefficient on grants is always positive as shown in figure 3.10. Its magnitude decreases as the window moves to more recent years. The coefficient on loans (figure 3.11), also in line with the long run, shows some negative estimates between the late 60s and the early 80s when it becomes consistently positive. The coefficient of loans therefore shows more instability than the one on grants.

[27] As before, interaction terms are also included for other explanatory variables although the results are not reported here. The previous results are largely confirmed and the interaction terms, as well as the dummies included as independent variables are never significant.

[28] Grants: F(3, 34) = 4.02, p-value: 0.015; loans: F(3, 34) = 4.15, p-value: 0.013.

[29] Estimates are based on the SR specification reported in column 1 of table 3.3.

Table 3.7: SR equation with structural breaks

	(1)	(2)	(3)	(4)
non-tax	-0.042	-0.043	-0.022	-0.012
	(-0.33)	(-0.34)	(-0.17)	(-0.09)
grants	0.415***	0.434***	0.637	0.490
	(3.21)	(3.32)	(1.01)	(0.74)
loans	0.241***	0.254***	-0.576	-0.640
	(2.88)	(2.98)	(-1.14)	(-1.22)
agri	0.127	0.066	0.163	0.090
	(1.32)	(0.60)	(1.55)	(0.73)
manuf	1.064**	0.838	1.177**	0.903
	(2.23)	(1.61)	(2.37)	(1.63)
trade	0.190***	0.207***	0.188***	0.207***
	(4.61)	(4.71)	(4.63)	(4.69)
GDPpc	-0.023	-0.005	-0.025	-0.006
	(-0.92)	(-0.16)	(-0.98)	(-0.21)
Derg		0.001		0.001
		(0.45)		(0.24)
EPRDF		-0.002		-0.003
		(-0.86)		(-0.95)
grants_derg			-0.016	0.088
			(-0.02)	(0.13)
grants_eprdf			-0.278	-0.082
			(-0.43)	(-0.12)
loans_derg			0.569	0.645
			(1.01)	(1.10)
loans_eprdf			0.869*	0.953*
			(1.70)	(1.78)
ECT	-0.928***	-0.955***	-0.967***	-0.973***
	(-5.49)	(-5.56)	(-5.44)	(-5.41)
Constant	0.000	0.000	0.001	0.001
	(0.27)	(0.06)	(0.53)	(0.35)
Observations	49	49	49	49
r2	0.59	0.61	0.65	0.66

Note: t statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. All variables are included in first difference and the dependent variable is the tax share.

Figure 3.8: CUSUM graph(SR)

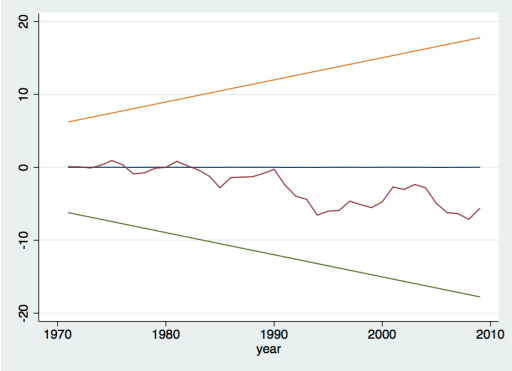


Figure 3.9: CUSUMSQ graph (SR)

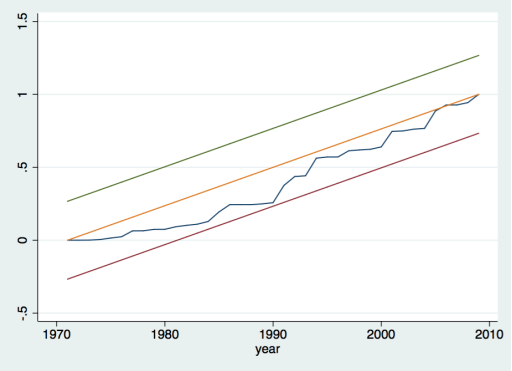


Figure 3.10: Grant rolling estimates (SR)

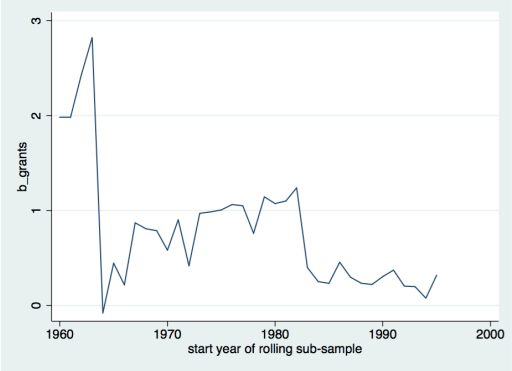
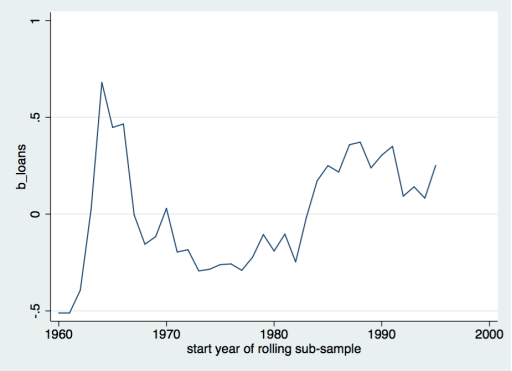


Figure 3.11: Loan rolling estimates (SR)



3.5.3 Estimation in logs

A further robustness check regards the way variables are measured, namely as shares of GDP. GDP figures are based on surveys and other estimates of economic activities. They may therefore be imprecise or change in time because of better estimation techniques. In addition GDP figures have been at the center of a heated debate in recent years, with many forign observers doubting their validity (Dercon and Zeitlin, 2009). The analysis is therefore repeated with the variables in logs instead of shares of GDP, to check whether it is indeed the denominator that drives the results.

Stationarity is tested for all variables and they all turn out to be I(1). It is therefore possible to proceed with the cointegration procedure as in the previous analysis. Table 3.I.1 in appendix 3.I reports the results for both the LR and SR.

The LR specification in logs still passes the Engle-Granger test for cointegration and it is therefore possible to carry out the standard two-step procedure. The results are robust to a different variable definition that excludes GDP at the denominator. Indeed previous results are largely confirmed when repeating the estimation in logs and particularly so for the aid variables that are positive and significant in all specifications. In particular a 1% increase in grants is associated with a 0.1% increase in tax revenue in the short run, while a 1% increase in loans would have a smaller effect of 0.05% on tax revenue.

Note that now the coefficient on the GDP gap is non-significant and positive, confirming the hypothesis that the negative and significant coefficient found in section 3.4 may be due to a built-in correlation with GDP at the denominator of the dependent variable. Indeed when tax is measured as a log, rather than a share of GDP, the GDP gap is not significant anymore.

The coefficients on other variables are largely similar to previous estimates. The only noteworthy change is the positive coefficient on agriculture, that is now significant whereas manufacturing fails to reach significance in all specifications.

3.6 Unpacking the effects: tax types and tax composition

Having carried out the analysis using the aggregate tax share, this section turns to the individual tax types to check if the identified effects run through a particular one of these. There are potentially various channels through which aid relates to tax revenue. For example aid may provide foreign exchange to purchase imports that, if taxed, contribute to increasing tax revenue. Aid may also provide support to tax reform aimed at increasing

Figure 3.12: Plot of tax types

Source: author's calculations using data from the Ministry of Finance and Economic Development

revenue collections from 'hard to tax' bases. By disaggregating tax revenue in tax types I am able to shed light on some of these channels. The aggregate tax share is therefore disaggregated into domestic indirect, direct and trade taxes, all of which are I(1). All three variables are taken in shares of GDP and are used as dependent variables. They are plotted in figure 3.12 to give a sense of their dynamics.

The LR results are reported in table 3.8 along with the Engle-Granger test statistic for cointegration, at the bottom of the table, to be compared with the MacKinnon critical values in table 3.2. Only the version of the test without lags is reported because no auto-correlation is detected. The direct tax and indirect tax equations pass the cointegration test in both specifications while the trade tax one does not. Table 3.9 therefore reports SR results, using the EG procedure, only for direct and indirect taxes. In addition results for trade taxes are reported for completeness, based on an ARIMA(0,1,0) model.

As far as the aid variables are concerned, the results generally show that their positive and significant effect on tax is mainly due to direct and trade taxes. In the long run, only loans is significant in the direct and trade tax equations, whereas grants never reach significance although the coefficients are always positive. Note that grants was significant only at the 10% level in the aggregate tax equation. In the short run however grants also becomes significant, and still positive, in both the direct and trade tax equations while loans is significant only in the former.

Focussing particularly on domestic taxes, these results are interesting because they indicate that the effect of aid may occur through stimulating the collection of 'hard to

Table 3.8: Tax types LR equations: direct, indirect and trade tax

	Direct tax		Indirect tax		Trade tax	
	(1)	(2)	(3)	(4)	(5)	(6)
grants	0.091	0.077	0.026	0.016	0.208	0.161
	(1.07)	(0.91)	(0.26)	(0.17)	(1.54)	(1.16)
loans	0.175***	0.177***	0.000	0.002	0.238***	0.246***
	(3.89)	(3.95)	(0.00)	(0.03)	(3.37)	(3.35)
non-tax	0.248***	0.267***	0.087	0.099	-0.172*	-0.112
	(4.07)	(4.60)	(1.22)	(1.47)	(-1.79)	(-1.18)
agri	-0.038	-0.058***	-0.038	-0.051**	0.129***	0.066*
	(-1.35)	(-2.79)	(-1.16)	(-2.12)	(2.89)	(1.95)
manuf	0.153		0.097		0.486**	
	(1.02)		(0.56)		(2.06)	
trade	0.009	0.003	-0.001	-0.006	0.136***	0.115***
	(0.59)	(0.19)	(-0.08)	(-0.34)	(5.56)	(4.97)
GDPpc	0.002	0.002	-0.001	-0.001	-0.008	-0.007
	(0.28)	(0.30)	(-0.11)	(-0.10)	(-0.62)	(-0.54)
Derg	0.004*	0.004*	0.002	0.002	0.011***	0.012***
	(1.85)	(1.92)	(0.64)	(0.68)	(3.24)	(3.24)
EPRDF	-0.006*	-0.007**	-0.007*	-0.008**	0.010*	0.006
	(-1.72)	(-2.19)	(-1.73)	(-2.06)	(1.81)	(1.13)
Constant	0.015	0.033	0.047	0.059	-0.049	0.010
	(0.22)	(0.53)	(0.62)	(0.81)	(-0.48)	(0.10)
Obs	50	50	50	50	50	50
r2	0.92	0.92	0.63	0.63	0.79	0.77
E-G test	-5.691	-5.883	-6.097	-6.185	-3.949	-3.840

Note: t statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. All variables are in levels, i.e. as shares of GDP except GDPpc and GDPgap. The dependent variables are: direct taxes (columns 1 and 2), indirect taxes (columns 3 and 4), and trade taxes (columns 5 and 6).

tax' handles, such as income and profits, whereas 'easy to tax' ones (i.e. consumption through indirect taxes) are already tapped[30]. This may also explain the non-significant coefficient in the indirect tax equation. In this context the introduction of the VAT, that was strongly supported by the international financial institutions, may play a minor role because it largely replaced pre-existing sales taxes. Figure 3.12 shows that in the early 90s indirect and trade taxes (both considered 'easy to collect') increased substantially while direct taxation lagged behind. This would support the view that income taxes are more difficult to raise, because of administrative capacity but also political constraints. In this context the stimulus effect of aid may happen both through technical assistance aimed at increasing local capacity; and through the interantional backing of donors and international financial institutions that may give legitimacy to politically difficult reforms.

Since trade is certainly considered 'easy to tax', this argument would however not be informative in explaining the positive coefficient of loans in the trade tax equation. That posive effect may instead be due to the increased availability of foreign exchange allowed through aid, that may fuel imports and in turn trade taxes. Note that the positive effect of aid on trade taxes is documented also elsewhere in the literature (Benedek et al., 2012).

Another interesting result is the coefficient on agriculture, that was consistently non-significant in all specifications notwithstanding its expected negative effect. Agriculture is generally found to have a negative effect on domestic direct and indirect taxes, as expected, while it has a positive effect on trade taxes, consistently with other studies in the literature (Aizenman and Jinjarak, 2009). The negative effect becomes significant once manufacturing is dropped both in the LR and SR equations, thus improving precision in the estimates (see appendix 3.E on multicollinearity)[31]. In the aggregate tax equation this expected negative effect of agriculture is probably offset by the positive one through trade taxes, thus making the coefficient largely non-significant. The positive sign on agriculture in the trade tax equation may be due to export taxes that have been largely reliant on agricultural exports, most notably coffee. Indeed Ethiopian exports are largely agricultural products and up to 2002/2003, when export taxes were eliminated, they represented an important source of revenue.

[30] Aizenman and Jinjarak (2009) provide a cross country analysis of the effects of globalization on 'easy to collect' and 'difficult to collect' taxes. In their classification, the former category includes trade taxes and seignorage, whereas the second one includes domestic direct (income, profits) and indirect (sales, VAT) taxes. However in the case of Ethiopia indirect taxes have been always considered 'easy to collect', as explained throughout chapter 2. Therefore it seems legitimate to consider only direct taxes on income and profits as 'hard to tax' in the discussion here.

[31] The equation excluding agriculture is not reported here for simplicity but it yields coefficients of the same sign and significance for other variables.

Table 3.9: Tax types SR equations: direct, indirect and trade tax

	Direct tax		Indirect tax		Trade tax	
	(1)	(2)	(3)	(4)	(5)	(6)
non-tax	0.110**	0.117**	0.036	0.028	-0.201**	-0.140
	(2.08)	(2.35)	(0.49)	(0.40)	(-2.15)	(-1.45)
grants	0.089*	0.088*	0.020	0.021	0.209**	0.188
	(1.74)	(1.74)	(0.27)	(0.30)	(2.12)	(1.37)
loans	0.140***	0.144***	-0.011	-0.015	0.033	0.064
	(4.11)	(4.43)	(-0.23)	(-0.33)	(0.56)	(0.88)
agri	-0.033	-0.047*	-0.089	-0.070*	0.157***	0.039
	(-0.73)	(-1.69)	(-1.41)	(-1.78)	(2.94)	(1.00)
manuf	0.084		-0.118		0.750*	
	(0.40)		(-0.39)		(1.87)	
trade	0.039**	0.040**	0.027	0.026	0.094***	0.096***
	(2.32)	(2.43)	(1.14)	(1.11)	(4.62)	(4.24)
GDPpc	0.012	0.014	0.018	0.014	-0.025	-0.005
	(1.00)	(1.38)	(1.03)	(0.98)	(-1.50)	(-0.35)
ECM	-0.726***	-0.739***	-0.927***	-0.916***		
	(-4.85)	(-5.11)	(-5.57)	(-5.65)		
Constant	-0.000	-0.000	-0.000	-0.000	0.001	0.000
	(-0.23)	(-0.31)	(-0.23)	(-0.17)	(0.93)	(0.06)
Dummies	yes	yes	yes	yes	yes	yes
Obs	49	49	49	49	49	49
r2	0.58	0.58	0.50	0.49	-	-

Note: t statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. All variables are included in first difference. The dependent variables are: direct taxes (columns 1 and 2), indirect taxes (columns 3 and 4), and trade taxes (columns 5 and 6). In the case of direct and indirect taxes, the results are fromt he second step of the EG procedure. For trade taxes the results are obtained using and ARIMA(0,1,0) model. Regime dummies for the Derg and EPRDF period are included in all equations.

Finally, an alternative approach to gaining insights into tax composition is to use a variable that indicates the share of domestic taxes (i.e. direct and domestic indirect) to total revenue. Tax composition, as defined here, is a central issue in developing countries where trade taxes still represent the lion's share of tax revenue. This is indeed the case in Ethiopia where in the last year of the sample trade taxes still contributed over 40% to total tax revenue, and over the whole period that share peaked at 56%. The international community has been concerned with the possibility of a shift towards domestic taxes and this idea has been at the basis also of the adoption of VAT by an increasing number of countries (Keen and Ligthart, 2002; Keen and Simone, 2004). Tax composition is used as a dependent variable, however this exercise did not yield satisfactory results or additional insight. It is therefore not reported here.

3.7 The positive aid-tax relation: interpretation

The main result of the analysis is a strong rejection of the disincentive effect that is sometimes argued in the context of the aid effectiveness debate. I show that aid is instead positively associated with the tax share. The positive effect is generally confirmed for both grants and loans, with some differences that are discussed later in this section.

This postive relation implies that aid and tax are not treated as substitutes but that instead increases in aid are associated with increases in taxes. Indeed aid may influence tax collection by contributing to improving the tax administration (thus decreasing administrative costs, for example by promoting the introduction of IT systems) and by providing international legitimacy for tax reform (thus decreasing political costs). Its coefficient in the reduced form equation is therefore the result of a negative effect due to possible substitution and a positive one through the reduction of the costliness of raising tax. The empirical results from Ethiopia suggest that the latter positive effect is larger than the possible negative one.

Turning to aid heterogeneity, while grants and loans appear to have both a positive effect on tax revenue, some differences emerge from the analysis. The idea developed in the literature (Gupta et al., 2004) that loans may stimulate tax mobilisation more than grants because of repayment, is partly confirmed. In the long run loans are always significant while grants only reach the 10% level in one specification. Despite this, no evidence can be provided for a LR detrimental effect of grants on tax effort. The coefficient on grants is consistently positive, also when rolling estimates are provided in section 3.5.2 both for the LR and SR.

In the short run both aid variables are significant above the 5% level and still positive, with grants having a larger coefficient than loans. This may suggest that grants are used mainly to release short run constraints in the administration, thus allowing a contemporaneous increase in tax revenue. Moreover both coefficients (grants and loans) are robust to the inclusion of governance in the equation, to capture institutional factors that are excluded from the main equations. The coefficient of grants in particular is also robust to taking into account endogeneity with IV estimation, while a satisfactory instrument cannot be found for loans.

A disaggregation of tax revenue into direct, indirect and trade taxes, shows that the positive effect of aid occurs primarily through direct and trade taxes. In the case of direct taxes, the explanation may be related to the beneficial effect of aid in supporting the increased mobilisation of 'hard to collect' taxes such as those on income and profits. Instead 'easy to collect' taxes such as those on consumption may already be tapped, thus not benefiting as much from aid. This explanation would not be appropriate in the case of trade taxes however, where the positive effect may be due to the provision of foreign exchange through aid.

In the Ethiopian context, the positive effect can be explained by two elements in particular: capacity building and matching[32]. Indeed capacity is the most widely cited constraint to tax revenue mobilisation in interviews, both with government officials and with donors. Aid is likely to have an effect on this capacity constraint thanks to technical assistance, additional resources for tax administration and external advisors. Ethiopia has received external advice and support in the area of taxation across the whole period, including assistance from the US, UN and WB during the Imperial period (see chapter 2). More recently taxation has remained one of the few policy areas of strong cooperation between donors and the government, while on other macroeconomic policies disagreement often occurs. For this reason the positive effect of aid through various capacity building activities is fully consistent with the Ethiopian context. By making the administration more efficient, aid may also contribute to making taxation less costly thus resulting in an increase in tax revenue.

At least three examples exist today in Ethiopia of this foreign role in the area of

[32]Other possible explanations can be provided for a positive effect of aid on tax revenue, which I however believe being secondary to capacity building and matching. For example aid may increase marketable surplus due to better infrastructure and thus increase revenue through indirect taxes on goods. It could also imply an increase in aid-related imports that, while largely duty-free, may still imply an increase in trade tax revenues.

taxation. The first one is the Public Sector Capacity Building program (PSCAP), one of the 6 themes of which is precisely taxation. Secondly PBS funds, amongst other things, projects aimed at raising awareness on tax issues, with the final objective of increasing compliance (see chapter 2). Indeed at least two interviewees mentioned that a basic knowledge about the budget process and what taxes are used for can help overcoming compliance and evasion problems. Finally the IMF has had a crucial advisory role both in the 2002 reform, that amongst other things introduced the VAT, and in the 2008 reforms (see chapter 2).

The second possible explanation is that the government is matching foreign resources with internal ones. This may happen because of two reasons. The most obvious one is that donors may require the governemnt to do so. While this is indeed the case, for example under PBS that includes an additionality clause, it does not seem that donors are really driving the matching effect. This is confirmed by the consistent over-performance of the Government of Ethiopia with respect to the revenue targets under PBS.

The second reason for matching is related to the specific historical and cultural characteristics of Ethiopia. Ethiopia is the only country in Africa to have never been colonized and this is deeply rooted in the national culture and pride. Not only does this translate in great policy ownership and a heavy weight attached to aid conditions and external influence; but also it implies a tradition of independence and a feeling that the country can 'stand on its own feet'. In this sense, as emerged also in a few interviews, having to rely on foreign funding to deal with domestic development challenges is a shame for Ethiopians. It means that the country is not able to 'feed its population' and to respond to its basic needs. This sentiment is clear in some of the speeches of the late Prime Minister Meles Zenawi who ruled Ethiopia for 20 years, and it is at the basis of the willingness of the Government to match foreign resources with domestic ones. In fact aid may even set an incentive for tax revenue mobilisation not only because of the possible dependence and shame coming with it, but also because it makes the ambitious development project happen. Again, this emerged in many interviews. Ethiopia has ambitious development projects that would be hard to implement only with domestic resources. The fact that aid is available makes the project realistic and feasible, thus giving momentum to domestic revenue mobilisation efforts.

The positive relation between aid and tax is reinforced by the fact that they are not treated as substitutes in Ethiopia but rather as complements. In addition to the elements discussed previously (i.e. independence, national pride, external influence) aid volatility

and unpredictability also prevent them to be substitutes. A plot of the three-year moving average of the tax and aid series shows very clearly that the latter is a much more volatile source of revenue than tax (see figure 3.2). Many interviewed government officials argue that it is not a sustainable source of funding because its little reliability makes it difficult to plan ahead.

3.8 Conclusions and policy implications

This chapter provided evidence on a positive relation between aid and tax in Ethiopia. The use of in depth qualitative information, that represents a novelty in the literature, is used to explain the results in the specific context of Ethiopia. Given the country-specific historical and political context, a positive relation between aid and tax seems particularly well grounded in Ethiopia and examples are provided throughout the chapter.

The main conclusion of the analysis is the presence of a strong and positive relation between aid and taxation, that is particularly robust for grants (particulalry to structural breaks and endogeneity). The positive results on grants and loans are robust to the inclusion of governance, that is often omitted from time series analyses of tax effort. As far as aid heterogeneity is concerned, grants and loans both have a positive sign although they present some differences in their LR and SR effects that are discussed in section 3.7.

The first policy implication is therefore that in the case of Ethiopia a crowding out effect of aid should not be a source of concern for donors. I find no evidence in Ethiopia of such a negative effect of aid on tax effort or of the opportunistic behavior that would result in a substitution between tax and aid. Instead the results support the idea that aid has been effective in supporting the administration and in strengthening institutions in the field of taxation.

In addition, the inclusion of other tax determinants in the analysis allows drawing a few broader conclusions and policy implications.

Firstly the effect of manufacturing is very large and significant, particularly in the long run equation. Its coefficient exceeds unity in some specifications, implying that a percentage point increase in the share of manufacturing in GDP results in an even higher increase in the tax share. For example the coefficient of 0.7 (in the preferred LR equation, column 3 in table 3.1) suggests that for each percentage point increase in the manufacturing share, 70% of it goes into increased tax. Besides arguments related to the high visibility and accessibility of manufacturing firms, this large effect may be due to the fact that firms act as tax collectors, as they transfer to the state taxed levied on employees' salaries

and on consumption. This result, by indicating the strong revenue generating potential of the manufacturing sector, underlines that industrial development has fiscal advantages in addition to the better documented benefits in terms of employment, formality and structural transformation.

Secondly trade displays the expected positive and significant coefficient in virtually all specifications. This is a confirmation of the major role that trade plays as a tax base in many developing countries, and particulalry in Ethiopia. Indeed Ethiopia is one of the African countries with the highest share of trade taxes in total revenue (OECD and African Development Bank Group, 2010). This clearly has implications in terms of trade liberalization. While the increase in trade flows would bring about more revenue, a decrease in tax rates may have an adverse revenue impact at least in the short term. It is therefore important to understand the balance between these two opposite effects and to provide for alternative sources of revenue in order to alleviate the possible negative effects of liberalization, particularly in countries like Ethiopia that are highly reliant on trade taxes.

Thirdly agriculture does not seem to have a significant effect on the aggregate tax share due to its contrasting effects on different tax types. While a positive effect is found for trade taxes, the expected negative one occurs for domestic direct and indirect taxes. This result is particularly worrying in the context of the efforts of developing countries to switch away from trade taxes towards domestic revenue (Keen and Simone, 2004). The agricultural sector may represent a possible opportunity for future reform to increase its revenue generation capacity, especially as commercial agriculture develops. However the subsistance and remoteness that characterize this sector are likely to remain major constraints to tax revenue mobilisation in Ethiopia.

Finally, also in line with much of the literature, the analysis largely fails to find a significant effect of GDP per capita.

Appendices

3.A Critical summary of existing theories

Two main models have been developed for the analysis of tax determinants and its relation with aid, namely Heller (1975) and Ezemenari et al. (2008).

Most empirical analyses of tax determinants are based on the theoretical framework developed initially by Heller in his seminal work (Heller, 1975). These include, amongst others, Mahdavi (2008), Leuthold (1991), Ghura (1998), Gang and Khan (1991), Franco-Rodriguez et al. (1998), Osei et al. (2003), and Mosley et al. (1987).

Heller's original model is based on the maximization of the public sector decision maker's utility function under the constraint that total revenues (including borrowing) should equal total expenditures. The utility function is represented by deviations of actual fiscal aggregates from target levels, and it is specified in a quadratic form so that marginal utility diminishes as the actual variables rise above the target levels. In this framework taxation is the policy instrument and it is therefore endogenous, while aid is considered exogenous. Franco-Rodriguez et al. (1998) later expanded the model to allow for endogenous aid. This original version of the model is the basis for fiscal response studies that typically only take into account fiscal variables (and growth in some cases). However this model has progressively been abandoned in favor of more a-theoretical approaches such as VAR and CVAR models.

Heller's original model largely inspired the theoretical framework developed in Leuthold (1991) in the context of a single equation model of tax determinants. While the author still estimates a target for tax revenue, along Heller's lines, other variables are included besides purely fiscal ones. In particular, variables representing the tax base are used and namely income, agriculture, mining and trade (imports + exports). Ghura (1998) further expanded Leuthold's model to include also corruption and economic policies and Mahdavi (2008) added further sets of variables to it. This framework is the basis for most empirical works focussing on a single equation for the tax share. These models are also referred to as tax effort studies because of the possibility to obtain an index of tax effort based on the ratio between actual and predicted tax share.

While the model developed by Heller has been used and developed by many authors, it is also subject to criticism. The two main points of this critique are the functional form and the computation of targets.

First, Binh and McGillivray (1993) note that meeting the target levels does not maximize utility in the original model and they suggest a change in the quadratic loss function that allows overcoming this problem. However even with this modification, the model still

implies the same effect on utility from overshooting or undershooting the target. This is clearly unrealistic. Feeny (2006) modifies the theoretical model to allow for asymmetries in policy preferences and finds that although this issue is of great theoretical interest, it implies few empirical consequences.

The second criticism regards the computation of targets. The way it is done in Heller (1975) is not convincing, as target values are predicted using lags of the actual value, or other variables for which theoretical justification is weak. Moreover, as pointed out in White (1994), it is important to analyze the R^2 of such auxiliary regressions. On the one hand a high value might simply mean that the actual value of the variable is very close to the target. This would reduce the meaningfulness of deviations from the target since it is estimated from the actual value. On the other hand, a small R^2 indicates a poor fit of the equation thus casting doubts on the validity of such targets.

Moreover the target values thus estimated do not necessarily meet the constraint of budget balance, as borrowing is set to zero. A possible solution would be to estimate the target values of revenue and expenditure and allow borrowing to be different from zero and thus fill the gap. Therefore the working of the model is heavily reliant on the targets that are determined in a way that is of dubious validity. In fact White (1994) even argues that the way in which targets are derived is a statistical artifact that leads to erroneous results in Gang and Khan (1991).

Departing completely from Heller's framework, Ezemenari et al. (2008) developed a model to analyze the effects of aid on tax and on public investment. The model is based on an intertemporal expenditure function, that describes the demand side of the economy and that "denotes the minimum expenditure (in present value) required to achieve a given level of utility at constant consumer prices and public good provision" (Ezemenari et al., 2008); and on a revenue function that represents the production side of the economy and that depends on the factors of production and prices. These two functions are then detailed and developed to describe the economy more specifically. No trade occurs in this economy and two periods are considered. The policy instruments are the tax rate and the share of public investment in total spending. Direct taxes are levied through a lump-sum tax that is exogenous and therefore the policy instrument is the consumption tax rate alone.

Three main propositions stem from the model and namely:

- An increase in foreign aid would reduce the proportion of government revenue that is allocated for public investment;
- Under certain conditions, an increase in foreign aid reduces the optimal level of

consumption tax rate;

- An increase in foreign aid increases the provision of the public good and, under certain conditions, it also increases both public and private investments.

These propositions stem from assumptions and conditions derived mathematically by the authors. While some of them are clear and plausible, others are less straightforward. In fact the paper fails to connect complex theoretical considerations to the reality of developing countries by explaining their plausibility in that context. Moreover, while clearly some simplification is necessary in a complex theoretical exercise, the exclusion of trade and direct taxation from the model represents a serious shortcoming. Indeed it is well known that trade is a major tax base in developing countries. In addition it is mainly in the area of direct taxes that tax benefits and exemptions take place (i.e. fiscal benefits for businesses). By looking only at the consumption tax rate, the paper fails to include in the analysis some of the most important aspects of taxation in developing countries.

The model suggests two equations to be estimated empirically, one for tax revenue and one for public investment. Interestingly the tax equation obtained is very similar to the one used in Heller-type models. Moreover the dependent variable in the empirical tax equation is the tax share, that includes all taxes and not only consumption ones. This implies a weak link between the theory and the empirics, as they focus on different variables. This also prevents to fully exploit the theory in interpreting the empirical results.

In conclusion this model brings some interesting elements to the analysis, namely the intertemporal dimension and the effect of aid on the share of public investment. Moreover it underlines the importance of moving away from the Heller framework and it offers a valuable contribution in this direction. However it does not seem to allow a better understanding of tax determinants than the standard tax effort models and it may not be suitable to providing a complete analysis of taxation in Africa.

3.B Summary of variables

Table 3.B.1: Summary of variables

Name	Definition	Mean	St. dev.	Min	Max
tax	Total tax revenue as a share of GDP	.082	.024	.039	.124
dirtax	Direct tax revenue as a share of GDP	.028	.012	.010	.048
indtax	Indirect tax revenue as a share of GDP	.022	.006	.010	.036
tradetax	Trade tax revenue as a share of GDP	.032	.011	.014	.061
grants	Foreign grants as a share of GDP	.020	.012	0	.047
loans	Foreign loans as a share of GDP	.020	.016	.002	.092
trade	Imports and export as a share of GDP	.187	.111	.085	.504
agri	Agriculture share of GDP	.591	.099	.415	.784
manuf	Manufacturing share of GDP	.048	.010	.026	.065
GDPpc	Log of constant GDP per capita	6.946	.154	6.733	7.494
GDPgap	Percentage deviation of GDP from trend (Hodrick-Prescott filter)	0	.134	-.312	.416
taxcomp	Direct and indirect domestic taxes as a share of total tax revenue	.600	.085	.439	.780

3.C Stationarity

Table 3.C.1: Results of Dickey-Fuller GLS test for trend-stationarity: levels

Variable	1 lag	2 lags	3 lags	4 lags	5 lags
tax	-2.39	-2.79	-2.68	-2.24	-2.01
dirtax	-2.48	-3.23	-2.43	-1.78	-2.04
indtax	-2.08	-1.91	-1.67	-1.62	-1.67
tradetax	-2.20	-2.35	-2.59	-2.70	-2.02
grants	-4.34	-2.88	-2.25	-2.80	-2.58
loans	-3.06	-2.42	-3.69	-2.57	-2.67
aid	-3.06	-2.59	-3.62	-2.78	-2.64
trade	-1.14	-1.19	-0.41	-1.38	-1.27
agri	-2.90	-1.97	-2.17	-2.05	-3.01
manuf	-1.63	-1.39	-1.29	-1.29	-1.42
GDPpc	-0.77	-0.37	-1.19	-1.14	-1.10

Note: H_0: non trend-stationarity. Critical values (5%): -3.202 (1 lag), -3.159 (2 lag), -3.108 (3 lag), -3.052 (4 lag), -2.992 (5 lag).

Table 3.C.2: Results of Dickey-Fuller GLS test for stationarity: 1st difference

Variable	1 lag	2 lags	3 lags	4 lags	5 lags
tax	-3.60	-3.40	-3.53	-3.26	-2.62
dirtax	-2.97	-3.70	-4.32	-3.08	-2.26
indtax	-4.52	-4.30	-3.57	-2.93	-2.81
tradetax	-4.17	-3.19	-2.77	-3.29	-2.58
grants	-8.90	-6.50	-3.90	-3.67	-2.94
loans	-6.06	-3.42	-4.19	-3.28	-3.67
aid	-6.25	-3.66	-4.28	-3.73	-3.56
trade	-4.27	-5.13	-2.65	-2.49	-2.44
agri	-6.32	-3.97	-3.43	-2.12	-2.70
manuf	-4.74	-4.07	-3.43	-2.79	-2.67
GDPpc	-4.65	-2.05	-1.95	-1.80	-0.80

Note: H_0: non stationarity. Critical values (5%): -2.285 (1 lag), -2.259 (2 lag), -2.230 (3 lag), -2.199 (4 lag), -2.167 (5 lag).

Table 3.C.3: Results of Kwiatkowski-Phillips-Schmidt-Shin test for trend-stationarity: levels

Variable	0 lags	1 lag	2 lags	3 lags	4 lags	5 lags
tax	0.34	0.19	0.14	0.12	0.11	0.10
dirtax	0.56	0.30	0.21	0.17	0.15	0.14
indtax	0.50	0.32	0.25	0.21	0.18	0.16
tradetax	0.33	0.18	0.13	0.11	0.09	0.09
grants	0.13	0.11	0.10	0.09	0.08	0.08
loans	0.17	0.11	0.09	0.08	0.08	0.08
aid	0.11	0.07	0.06	0.06	0.05	0.06
trade	0.90	0.49	0.35	0.27	0.23	0.20
agri	0.28	0.17	0.13	0.11	0.10	0.09
manuf	0.85	0.46	0.33	0.27	0.23	0.20
GDPpc	0.67	0.37	0.27	0.21	0.18	0.16

Note: H_0: series is trend-stationary. Critical values: 10%: 0.119, 5% : 0.146, 1% : 0.216.

Table 3.C.4: Results of Kwiatkowski-Phillips-Schmidt-Shin test for stationarity: 1st difference

Variable	0 lags	1 lag	2 lags	3 lags	4 lags	5 lags
tax	0.05	0.06	0.05	0.06	0.06	0.07
dirtax	0.10	0.08	0.07	0.06	0.07	0.08
indtax	0.04	0.06	0.07	0.09	0.10	0.11
tradetax	0.05	0.05	0.05	0.05	0.05	0.06
grants	0.02	0.03	0.05	0.06	0.06	0.07
loans	0.05	0.05	0.07	0.07	0.08	0.11
aid	0.05	0.06	0.08	0.08	0.10	0.12
trade	0.30	0.31	0.31	0.38	0.38	0.39
agri	0.05	0.05	0.06	0.08	0.08	0.07
manuf	0.31	0.26	0.26	0.27	0.29	0.29
GDPpc	0.58	0.46	0.46	0.42	0.37	0.36

Note: H_0: series is stationary. Critical values: 10%: 0.347, 5% : 0.463, 1% : 0.739.

Table 3.C.5: Results of Clemente, Montanes, Reyes unit root test with two structural breaks: levels

variable	break 1	break 2	test stat
tax	1974	1990	-3.89
	0.01	0.39	.
dirtax	1976	1990	-3.85
	0.00	0.47	.
indtax	1977	1989	-6.76
	0.00	0.00	.
tradetax	1987	1991	-3.55
	0.06	0.00	.
grants	1982	1998	-6.69
	0.00	0.00	.
loans	1998	2003	-2.12
	0.00	0.00	.
aid	1979	1998	-4.99
	0.00	0.00	.
trade	1990	2002	-3.65
	0.00	0.00	.
agri	1976	1995	-2.68
	0.10	0.01	.
manuf	1976	1989	-3.58
	0.01	0.02	.
GDPpc	1981	2002	-2.76
	0.10	0.00	.

Note: H_0: presence of unit root, i.e. non stationarity. Critical value for last column statistic: -5.49 (5%). P-values for statistical significance of the break are reported under the estimated break year.

Table 3.C.6: Results of Clemente, Montanes, Reyes unit root test with two structural breaks: 1st diff

variable	break 1	break 2	test stat
tax	1987	1990	-8.61
	0.00	0.00	.
dirtax	1987	1991	-5.63
	0.00	0.00	.
indtax	1964	1990	-9.81
	0.05	0.55	.
tradetax	1975	1992	-8.87
	0.22	0.12	.
grants	1966	1999	-7.70
	0.01	0.62	.
loans	1992	2000	-8.11
	0.86	0.00	.
aid	1998	2002	-7.01
	0.00	0.00	.
trade	1990	2001	-8.51
	0.00	0.20	.
agri	1983	1989	-3.54
	0.01	0.01	.
manuf	1982	1989	-9.71
	0.08	0.61	.
GDPpc	1983	2001	-3.76
	0.30	0.00	.

Note: H_0: presence of unit root, i.e. non stationarity. Critical value for last column statistic: -5.49 (5%). P-values for statistical significance of the break are reported under the estimated break year.

3.D Autocorrelation tests

Table 3.D.1 reports results for autocorrelation tests and particularly the Durbin-Watson test, that require all variables to be strictly exogenous, as well as the alternative Durbin and Breusch-Godfrey tests that instead do not require strict exogeneity. The tests are run for the first three specifications of table 3.1, and they show that indeed autocorrelation is not detected once structural breaks are modeled in specifications 2 and 3.

Table 3.D.1: Autocorrelation tests (first step)

specification	test	stat	p-value	result
(1)	Durbin-Watson	1.00	n.a.	reject
	Durbin's alternative	11.102	0.001	reject
	Breusch-Godfrey	10.862	0.001	reject
(2)	Durbin-Watson	1.837	n.a.	inconclusive
	Durbin's alternative	2.26	0.790	can't reject
	Breusch-Godfrey	0.093	0.760	can't reject
(3)	Durbin-Watson	1.927	n.a.	inconclusive
	Durbin's alternative	0.008	0.930	can't reject
	Breusch-Godfrey	0.010	0.920	can't reject

H_0 for all tests = no serial correlation.

Table 3.D.2: Autocorrelation tests (second step)

dummies	test	stat	p-value	result
no	Durbin-Watson	1.641	n.a.	inconclusive
	Durbin's alternative	2.469	0.116	cannot reject
	Breusch-Godfrey	2.918	0.088	cannot reject
yes	Durbin-Watson	1.665	n.a.	inconclusive
	Durbin's alternative	2.070	0.150	cannot reject
	Breusch-Godfrey	2.596	0.107	cannot reject

H_0 for all tests = no serial correlation.

'Dummies' in the first column refers to the regime shift dummies.

3.E Multicollinearity

Multicollinearity occurs when two regressors co-vary thus making the estimation less precise as it is not easy to identify the separate effect of the two variables. When there is perfect multicollinearity, the problem becomes one of identification rather than of precision only. In tax determinants models, multicollinearity typically concerns GDP per capita and the agricultural share. However it may occur also between agriculture and manufacturing or trade.

Multicollinearity can be detected using two techniques. First, the R^2 of the main regression is compared with the R^2 of auxiliary regressions of one regressor on the others. An R^2 from the latter equation that is larger than the former, suggests the presence of multicollinearity.

Secondly variance inflation factors (VIF) may be used, and their inverse is called the tolerance. The critical thresholds for these values vary and researchers use 5, 10 or 20 for VIF.

Table 3.E.1 reports tolerance ($1/VIF$) and VIF values for the LR and SR equations. The problem seem to occur mostly in the LR while VIFs for the second step, with variables in first difference, are very low. In the LR equation the most problematic variables seem to be agriculture and trade, both with VIFs exceeding the 5 and 10 threshold. This is confirmed by looking at the R^2 from auxiliary regressions of these variabls on other regressors that indeed is very high, respectively at 0.965 and 0.908 for agri and trade. Particularly the R^2 from the agriculture auxiliary regression is higher than any of the R^2 obtained in the first stage regressions (see table 3.1). This and the high VIF shown in table 3.E.1 confirm that multicollinearity affects this variable in particular. Indeed when multicollinearity is taken into account in table 3.1 its coefficient changes sign from positive to the expected negative one although it is still largely non-significant.

As far as the second step is concerned (last two columns of table 3.E.1), VIFs are much lower and they do not flag a problem, being all well below even the 5 threshold.

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Table 3.E.1: Tolerance and VIF

	1st step		2nd step	
Variable	VIF	(1/VIF)	VIF	(1/VIF)
Agri	17.26	0.058	2.97	0.337
Trade	10.11	0.099	1.39	0.718
Manuf	5.52	0.181	2.71	0.369
GDPpc	4.51	0.181	1.59	0.630
Non tax	3.98	0.251	1.24	0.806
Grants	3.59	0.279	1.32	0.760
Loans	2.00	0.499	1.12	0.893
Mean VIF	6.71		1.70	

3.F Influential observations

Two methods are used to identify outliers and influential observations: deviations from the three-year moving average of aid (main variable of interest) and standardized residuals. The first method allows the identification of the three highest negative deviations in 1977, 1983, and 2005; and the three highest positive ones in 1998, 1978 and 1993. These dates can easily be matched with relevant events in Ethiopia and in particular:

- 1977 and 1978 are marked by the total withdrawal of US aid in response to the newly established Derg regime. In 1978 the Ogaden war involved a scale-up of Soviet support that largely substituted US aid.
- 1983 appears as a large negative deviation probably due to the high moving average in that period, due to the famine erupting right after that time, in 1984, that attracted much international support.
- 1993 is the year in which Ethiopia engages in its first Structural Adjustment Program that brought to the country a large amount of loans.
- 1998 is the year in which the war with Eritrea starts.
- 2005 is marked by the elections and particularly the following rupture in relations with donors that brought to the withdrawal of direct budget support.

Secondly, the three lowest and highest standardized residuals from the LR and SR equations are identified as follows:

- In the long run equation the largest standardized residuals are in 1975, 2008 and 1984 (negative); and 1963, 2003 and 1983 (positive).
- The largest standardized residuals produced by the short run equation are in 2005, 1991 and 1984 (negative); and 1963, 2001 and 1997 (positive).

The years identified are easily traced back to historical events such as the 1984 famine, the 2005 elections and the reform momentum in the early 60s following the attempted coup. Moreover high residuals are observed in correspondence of the regime change in 1991, the war with Eritrea (1997 and 2001), and the tax reforms of 2008 that were accompanied by a more assertive approach to tax enforcement.

Table 3.F.1 reports the long run and short run results for three different specifications. The first one is the preferred specification including all observations, and the LR and SR

results are reported in the columns marked (1). The second specification excludes the years identified using the 3-years MA of aid, and the results are reported in the columns marked (2). Finally the observations with highest standardized residuals are excluded and the results reported in the columns marked (3) are obtained.

The coefficients on the aid variables appear to be robust to the exclusion of these observations. The coefficient on *grants* remains similar, both in magnitude and significance, both in the SR and LR. The coefficient on loans also seems robust to dropping outliers although it is not significant in the SR equation once observations with high standardized residuals are dropped (SR equation, column 3). The results on other variables are largely in line with the previous results.

Table 3.F.1: Tax regression without influential observations

	(1) LR	(2) LR	(3) LR	(1) SR	(2) SR	(3) SR
grants	0.325*	0.290	0.246*	0.434***	0.460***	0.565***
	(1.78)	(1.60)	(1.87)	(3.32)	(3.49)	(5.12)
loans	0.413***	0.416***	0.400***	0.254***	0.273***	0.073
	(4.31)	(4.34)	(5.90)	(2.98)	(3.09)	(1.04)
non-tax	0.163	0.220	0.254**	-0.043	0.040	-0.046
	(1.26)	(1.51)	(2.50)	(-0.34)	(0.32)	(-0.55)
agri	0.052	0.070	0.013	0.066	0.001	0.105
	(0.87)	(1.20)	(0.30)	(0.60)	(0.01)	(1.12)
manuf	0.736**	0.792**	0.445*	0.838	0.299	0.937**
	(2.31)	(2.43)	(1.93)	(1.61)	(0.61)	(2.33)
trade	0.144***	0.172***	0.080***	0.207***	0.304***	0.260***
	(4.34)	(4.08)	(3.11)	(4.71)	(5.98)	(7.26)
GDPpc	-0.007	-0.015	0.026	-0.005	0.018	-0.007
	(-0.39)	(-0.81)	(1.66)	(-0.16)	(0.61)	(-0.26)
Derg	0.017***	0.015***	0.020***	0.001	0.001	0.003
	(3.61)	(3.05)	(5.90)	(0.45)	(0.34)	(1.62)
EPRDF	-0.003	-0.003	0.002	-0.002	-0.002	-0.002
	(-0.42)	(-0.47)	(0.38)	(-0.86)	(-0.95)	(-0.76)
Constant	0.012	0.049	-0.174	0.000	-0.000	-0.001
	(0.08)	(0.36)	(-1.41)	(0.06)	(-0.20)	(-0.62)
Obs	50	44	44	49	43	43
r2	0.91	0.93	0.96	0.61	0.70	0.80

Note: t statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Columns marked (1) report the main results for allowing comparison; columns marked (2) report the results obtained by dropping observations with high deviations from the aid 3-year moving average; columns marked (3) report the results on a sample where observations with high standardized residuals were dropped.

3.G Non linearities

To account for possible non-linearities, I try to include quadratic terms for the aid variables in the LR ans SR equations. Once the quadratic terms are included in the LR, cointegration can still be found accrding to the Engle-Granger test that yields a statistic of -6.684 against a 5% critical value of -6.588. Both in the LR and in the SR the inclusion of the squared terms makes the aid variables, along with the additional terms, non-significant. However the squared terms and the aid variables are significant when tested jointly (i.e. $grants$ and $grants^2$, and $loans$ and $loans^2$), except for grants in the long run equation. The p-values resulting from the F-tests for joint significance are 0.243 (LR) and 0.001 (SR) for grants; and 0.004 (LR) and 0.013 (SR) for loans.

The squared grants variable has a negative coefficient both in the LR (though non significant) and in the SR, thus offering some weak support of decreasing marginal benefits as outlined in the theory.

Table 3.G.1: Non linearities: inclusion of squared terms

	(1) LR	(2) LR	(3) SR	(4) SR
grants	0.325*	0.344	0.434***	0.570
	(1.78)	(0.68)	(3.32)	(1.08)
$grants^2$		-0.102		-0.798
		(-0.01)		(-0.09)
loans	0.413***	0.356	0.254***	-0.014
	(4.31)	(1.11)	(2.98)	(-0.06)
$loans^2$		0.640		2.857
		(0.19)		(1.28)
non-tax	0.163	0.168	-0.043	-0.013
	(1.26)	(1.23)	(-0.34)	(-0.10)
agri	0.052	0.054	0.066	0.072
	(0.87)	(0.86)	(0.60)	(0.61)
manuf	0.736**	0.751**	0.838	0.939*
	(2.31)	(2.10)	(1.61)	(1.75)
trade	0.144***	0.144***	0.207***	0.201***
	(4.34)	(4.17)	(4.71)	(4.37)
GDPpc	-0.007	-0.007	-0.005	-0.004
	(-0.39)	(-0.41)	(-0.16)	(-0.14)
Derg	0.017***	0.017***	0.001	0.001
	(3.61)	(3.45)	(0.45)	(0.48)
EPRDF	-0.003	-0.003	-0.002	-0.002
	(-0.42)	(-0.34)	(-0.86)	(-0.83)
ECT			-0.955***	-0.976***
			(-5.56)	(-5.64)
Constant	0.012	0.014	0.000	0.000
	(0.08)	(0.10)	(0.06)	(0.03)
Observations	50	50	49	49
r2	0.91	0.91	0.61	0.63

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

3.H Granger causality test

The test devised by Granger (Granger, 1969) is a common way to test for endogeneity in time series. Originally the test is based on a VAR between two variables but it can be applied to three or more variables simply by including them in the underlying VAR. The test is based on a criterion of incremental predictive power: if Y is better predicted by past values of X and Y together than of Y alone, then X is said to Granger-cause Y. The null hypothesis of non-causality (in the Granger sense) is tested with a Wald test on the joint significance of the coefficients on the lags of X in the equation explaining Y. This test is rather limited for at least two reasons. First, it is purely statistical as it does not take into account any suggestion by social or economic theory. Secondly it only explores endogeneity in terms of its temporal dimension and it is therefore of little help when endogeneity is due to omitted factors. Table 3.H.1 reports the results from the test, including all the variables of the empirical model. The first eight rows of table 3.H.1 report the results for the tax equation (i.e. tax on the LHS). The remaining rows report, for completeness, the results for tax in the equations explaining all other variables. Other results are excluded for the sake of clarity. The test shows that both grants and loans Granger-cause tax, though the latter only at the 10% level. Tax does not Granger cause any of the explanatory variables at the 5% level, but the null of non-causality can be rejected at the 10% level in the grants equation. However a different specification of the model including only tax and the aid variables fails to support Granger-causality from tax to grants even at the 10% level, underlining the weakness of this result.

Table 3.H.1: Results of Granger causality test

Equation	tested	chi2	p
tax	nontax	1.49	0.47
	grants	8.52	0.01
	loans	5.03	0.08
	agri	0.92	0.63
	manuf	2.88	0.24
	trade	0.86	0.65
	gdppc	6.16	0.05
	ALL	37.37	0.00
nontax	tax	2.75	0.25
grants	tax	5.58	0.06
loans	tax	0.66	0.72
agri	tax	2.66	0.26
manuf	tax	0.26	0.88
trade	tax	3.41	0.18
gdpps	tax	3.20	0.20

3.I Results from estimation in logs

Table 3.I.1: Estimation in logs: LR and SR

	(1) LR	(2) LR	(3) SR	(4) SR
grants	0.068***	0.068***	0.108***	0.108***
	(3.38)	(3.31)	(5.74)	(5.66)
loans	0.084**	0.085**	0.049**	0.047**
	(2.60)	(2.54)	(2.20)	(2.05)
nontax	0.082	0.079	0.027	0.021
	(1.54)	(1.37)	(0.61)	(0.44)
agri	0.741***	0.750**	0.056	0.122
	(2.73)	(2.64)	(0.17)	(0.34)
manuf	0.152	0.156	0.084	0.106
	(1.04)	(1.03)	(0.47)	(0.57)
trade	0.545***	0.548***	0.534***	0.529***
	(8.06)	(7.68)	(5.46)	(5.31)
GDPpc	-0.759*	-0.790	0.000	0.000
	(-1.84)	(-1.65)	(0.68)	(0.36)
GDP gap		0.017		0.047
		(0.13)		(0.45)
ECT			-0.945***	-0.927***
			(-6.09)	(-5.72)
Constant	-1.781	-1.698	-0.005	-0.004
	(-1.14)	(-1.00)	(-0.19)	(-0.19)
Dummies	yes	yes	yes	yes
Obs	50	50	49	49
r2	1.00	1.00	0.77	0.77

Note: t statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Columns 1 and 3 report the preferred specification while columns 2 and 4 add the GDP gap variable. This variable in particular is included to check if a negative coefficient can still be found once GDP is not on the LHS anymore.

Chapter 4

Fiscal effects of aid in Ethiopia: a CVAR analysis

4.1 Introduction

This chapter[1] explores the public budget's dynamics in Ethiopia, particularly focussing on the fiscal effects of aid. It therefore takes a broader perspective than chapter 3 by looking at the budget as a whole rather than focussing on tax revenue and its determinants. In particular the expenditure side of the budget is also considered here, as well as its long run relation with both domestic and foreign sources of revenue.

To this purpose we use the cointegrated vector auto-regressive (CVAR) methodology that allows estimating simultaneous equations, thus being better suitable to describe budget dynamics than single equation models. Moreover this methodology allows for the existance of multiple long run relations that may indeed be expected once all budget variables are taken into account[2].

Since the VAR model is highly demanding of the data and the inclusion of an additional variable would imply a large increase in the number of parameters to be estimated, we include only a maximum of 5 variables in the model. The bulk of the chapter discusses a model of tax, non-tax revenue, grants, loans and total expenditure. We also estimate an alternative system that looks at public expenditure in more detail by disaggregating it into the capital and recurrent components. In this alternative system tax and non-tax revenue are aggregated into domestic revenue. The estimation of the two systems also

[1] This chapter is based on co-authored work with Emijlia Timmis (University of Nottingham).

[2] For a more detailed discussion on the differences and complementarity between CVAR and single equation models, see the introduction to this thesis.

allows a robustness check and indeed the two sets of results are largely consistent.

Our results provide evidence for the existence of a domestic budget equilibrium that is robust to different specifications. Moreover we find that both aid variables (i.e. grants and loans) are positively related to tax revenue in the long run, thus failing to provide evidence for a disincentive or substitution effect. In addition we find that foreign aid is positively related with expenditure, and more so with grants than loans. The disaggregation of expenditure shows that this result is largely driven by capital expenditure, that is also more strongly associated to grants than loans. In the case of recurrent spending instead the effects of the two aid variables is more similar.

One of the key advantages of our study over similar CVAR applications for Africa lies in our data. In particular we use annual data from 1960 to 2009 compiled by the Ministry of Finance and Economic Development (MOFED) of Ethiopia[3]. Not only the series are longer than those used in most other studies in the literature, but also they are obtained from a single domestic source. By using national data we are able to capture the recipient's measure of aid, which is what is effectively disbursed through the budget and what the government is aware of. Therefore it is the component and the measure of aid most relevant for the analysis of its fiscal effects.

The CVAR framework allows us to test a rich set of hypothesis on aid and budget dynamics, which can be summarized in four broad issues of interest.

Firstly, we explore the existence of a domestic budget equilibrium that would include only domestic variables and exclude aid. The existence of such a domestic equilibrium implies that the government makes long term plans based on domestic sources, while aid is an addition to such pre-existing long run relation. The question of whether aid is part of the budget process or rather it is an external source of financing that relaxes an existing domestic budget constraint is also closely related to the issue of exogeneity, which is discussed throughout the chapter. This issue is also relevant in the context of aid volatility and predictability, which make it harder for governments to take aid into account in their spending plans and therefore to make it part of the long run budget equilibrium.

Secondly we can expect a positive relation of aid with expenditure. To which extent they are related and whether aid is spent for the intended purpose are issues that can be explored empirically. In particular the latter issue has been the focus of fungibility studies that have tried to establish if aid was spent for its intended purpose. However a definition

[3]Note that since we are taking logs and since the first three observations for grants are very close to zero, the effective sample is 1963-2009.

of what is exactly to be considered the 'good' way to spend aid in terms of components of public expenditure is still a contentious issue (McGillivray and Morrissey, 2000).

Thirdly aid can influence tax revenue and, amongst others, it may discourage tax effort to the extent that it may provide a politically cheaper source of revenue than taxation. This, in theory, is particularly the case for grants than for loans, since the latter require re-payment in the future (Gupta et al., 2004; Morrissey et al., 2006; Benedek et al., 2012). However this view is rather simplistic since aid may also help in strengthening tax administration and improving tax policy, besides the possible positive effects through income, as argued in chapter 3.

Finally, aid may not be all spent in additional public expenditure but also be used to decrease borrowing. Since aid relaxes the domestic budget constraint (i.e. the budget equilibrium excluding aid variables), the government can now achieve the same level of expenditure with less domestic borrowing.

This chapter therefore explores the four hypothesis outlined above and, more specifically, is guided by the following research questions.

- Does the budget balance hold as an equilibrium relation in the long run?
- Is aid part of that long run equilibrium relation?
- Does aid discourage tax revenue?
- Does aid increase spending?
- Which components of spending are most affected by aid?
- Does aid heterogeneity (i.e. grants and loans) matter and what are the differences in the behavior of the two aid components?

4.2 Literature review

The literature on the fiscal effects of aid is largely based on the seminal work of Heller (1975) that set the theoretical basis for fiscal response models. This type of model in particular look at the effect of aid on fiscal aggregates including expenditure (recurrent and capital), domestic revenue (typically tax, but also non-tax revenue) and deficit. The framework is based on the maximization of the government's utility function, represented by deviations of actual fiscal aggregates from target levels. The utility function is specified in a quadratic form so that marginal utility diminishes as the actual variables rise above

the targets[4]. The fiscal response model is then estimated empirically, after the target values have also been estimated using available data.

Criticism to this framework involved both theoretical and empirical issues[5]. As far as the former is concerned, Binh and McGillivray (1993) note that meeting the targets does not necessarily maximize utility and that it is not realistic to assume a perfectly symmetric objective function where overshooting or undershooting the targets has the same effect on utility. On the empirical side, targets are often estimated using lagged values of the actual variable and other variables for which the theoretical justification is weak, which casts doubts on their validity.

Parallel to fiscal response models, another related strand of the literature is concerned with the estimation of tax effort models, or models of tax determinants. These are typically focused on a single equation explaining the tax share of GDP with aid and a number of other explanatory variables (as done in chapter 3). While tax effort models precede Heller's seminal work (Chelliah, 1971; Chelliah et al., 1975), they were further developed to include the fiscal response theoretical framework (Leuthold, 1991; Ghura, 1998; Mahdavi, 2008). The early studies focused mainly on tax determinants such as agriculture, mining and trade, then the interest shifted more towards aid and its effect on tax revenue mobilisation (Morrissey et al., 2006; Benedek et al., 2012; Clist and Morrissey, 2011). While results on tax determinants are rather un-contentious, the ones on aid are contrasting in the literature with evidence available for both a positive and a negative effect of aid on tax revenue.

With the aim of overcoming the problems inherent with Heller's framework and with single equation models, the CVAR has attracted increasing attention in the analysis of fiscal dynamics[6]. Indeed the CVAR has at least two advantages with respect to other approaches in the literature: first, it does not require a theoretical structure and the calculation of targets, and secondly it does not impose exogeneity but it rather allows the researcher to test for it. In practice however economic theory is often invoked in the design of a CVAR particularly as regards restrictions to be applied to the model, that can then be tested empirically. Since the estimation of simultaneous equations for the long run and short run involves a large number of parameters, the CVAR ideally requires large samples.

[4]Note that in this framework overshooting or undershooting the targets gives the same utility.

[5]See chapter 3 for a more detailed critical discussion of Heller's theoretical framework.

[6]However the CVAR is not a good substitute for tax effort models that typically include a larger number of variables. Such relatively large set of variables could hardly be accommodated in a CVAR model in the context of the typically small samples available for developing countries.

As this is often not the case in developing countries, only a limited number of variables are usually included to preserve degrees of freedom. Since we are carrying out a CVAR analysis of fiscal dynamics in a developing country, we focus on this particular literature in the following paragraphs.

Table 4.2.1 summarizes the studies of the fiscal literature that use CVAR and for each of them reports some details about the variables and data used, including the data transformation (in parenthesis in the data column). It is to be noted here that other studies in the literature use CVAR on developing countries but they are excluded from this detailed review because they do not focus on fiscal dynamics. These are for example: Mavrotas (2002), looking at the effect of aid on growth; M'Amanja and Morrissey (2006) on aid, investment and growth in Kenya; and Juselius et al. (2011) exploring the effect of aid on key macroeconomic variables in a panel of African countries. Since a substantial part of aid flows into the public budget, an analysis of the fiscal effects of aid can be seen as a prerequisite to understanding the macroeconomic effectiveness of aid (McGillivray and Morrissey, 2000; Lloyd et al., 2009). In this sense, by focusing on the fiscal variables we are therefore making a step back with respect to the literature on the macroeconomic effects of aid.

Before getting into the details of the individual papers, a couple of general elements emerge from table 4.2.1. First of all, most papers use a very limited number of observations, reaching a maximum of 39 years. The exception to this is Martins (2010) that can rely on a larger sample due to the use of quarterly data for Ethiopia. While quarterly data allows the author to increase the sample size and conveniently to consider only a period of relative political stability while preserving the number of observations, our approach is in favor of annual data instead. The reason for this is twofold. Indeed quarterly data for Ethiopia is available but it is not reliable as it is only compiled seriously after the introduction of the Protection of Basic Services (PBS) project in 2005 when donors became more careful about monitoring and reporting. In addition budget decisions are taken annually and intra-year dynamics do not necessarily add relevant information. Therefore, while we take the Martins (2010) paper as a reference point, as it analyses Ethiopia as well, we depart from it both by using annual data and by exploiting deeper qualitative information about the country context.

The second general element emerging from the literature is the small number of variables included in the models. In particular most studies include only 4 or maximum 5 variables to preserve the robustness of estimates with an already limited number of degrees

Table 4.2.1: Summary of CVAR fiscal literature

Paper	Country	Obs.	Variables	Data
Fagernas and Schurich (2004)	Malawi	31	Loans , grants, ODA, domestic borrowing, domestic revenue, development expenditure, recurrent expenditure	National, WDI, IMF Statistical Appendices (levels in local currency at constant prices)
Fagernas and Roberts (2004a)	Uganda	26	Loans, grants, ODA, domestic borrowing, domestic revenue, development expenditure, recurrent expenditure, total expenditure	National, IMF (levels in local currency at constant prices)
Fagernas and Roberts (2004b)	Zambia	27	Loans, grants, ODA, domestic borrowing, domestic revenue, development expenditure, recurrent expenditure	WDI, IMF-IFS, OECD-DAC aid data (levels in local currency at constant prices)
M'Amanja et al. (2005)	Kenya	39	Expenditure, tax, aid (grants and loans), growth National (logs)	
Osei et al. (2005)	Ghana	33	Expenditure (capital and recurrent), tax, aid, domestic borrowing	IMF (fiscal variables) and OECD-DAC aid data (levels in USD at constant prices)
Lloyd et al. (2009)	Developing countries	30	Foreign financing, capital expenditure, recurrent expenditure, tax revenue, domestic borrowing	WB's World Development Indicators (deflated nominal value in local currency)
Martins (2010)	Ethiopia	60	Development expenditure, current expenditure, domestic revenue, grants, loans, domestic borrowing	National (deflated nominal value)
Bwire (2013)	Uganda	37	Expenditure, aid, tax, domestic borrowing	National (fiscal variables) and OECD-DAC aid data (deflated nominal value)

of freedom. Note that the studies on Malawi, Zambia and Uganda include the variables reported in table 4.2.1 alternatively in different models, also with a maximum of 5 variables for each model and most commonly only using 4 (Fagernas and Schurich, 2004; Fagernas and Roberts, 2004a,b). The exception again is Martins (2010) with 6 variables, the inclusion of which is probably allowed by the larger sample. All papers exclude one or more variables from the analysis, to avoid estimating an identity, and most commonly domestic borrowing and/or non-tax revenue.

Furthermore it is to be noted that the variables can be included either in levels or in

logs, with the former being prevalent in the studies reported in table 4.2.1. In the larger CVAR literature however log transformation is quite common and it is used for example in Juselius et al. (2011) and M'Amanja and Morrissey (2006). In either case, variables are always deflated to reflect constant rather than current values.

Finally a general element emerging throughout the literature is the importance of considering the country context in designing the CVAR system, particularly when the number of observations is small. In particular knowledge of the historical and political context can help in two related ways. Firstly it can explain variations and large residuals emerging from the analysis with detailed qualitative information. Secondly it can help in designing the deterministic components of the CVAR, such as dummies and shifts that are necessarily related to country-specific events (political, economic or natural). These country-specific elements are included, for example, in the analysis presented in Juselius et al. (2011) and Bwire (2013).

Moving on to the detailed results of each paper, we follow a chronological order.

The set of studies by ODI/DFID on Malawi, Uganda and Zambia were inspired by an early version of Osei et al. (2003), which was published in 2005 and is reviewed in the next paragraph. They all adopt the same approach of estimating a set of different models based on the CVAR methodology, including different sets of variables. In Fagernas and Roberts (2004b) however all series resulted to be stationary and therefore only a simple VAR, rather than a CVAR, was implemented. We therefore focus on the results of the other two papers. Fagernas and Roberts (2004a) find that in Uganda both grants and loans have the expected positive effect on total expenditure, with grants having a stronger positive impact on the development component than on the current one of expenditure. In addition a long run positive effect of aid on domestic revenue can be identified, while the effect on domestic borrowing is negligible instead. The evidence from Malawi (Fagernas and Schurich, 2004) is largely in line with that on Uganda. In particular both grants and loans are shown to have a positive impact on development expenditure while the results are less clear in the case of recurrent expenditure. In addition there is no solid evidence that aid discourages tax effort in Malawi.

Osei et al. (2005) focus on the impact of aid on fiscal policy in Ghana using two models: one with aggregate expenditure and the second one further disaggregated into capital and recurrent expenditure. In both cases they provide support for strong exogeneity of foreign aid. The main finding is that aid in Ghana is associated with beneficial policy responses. In particular it increased tax effort and it decreased domestic borrowing. The evidence

seems to suggest that aid and domestic borrowing are treated as substitutes and that it is therefore difficult to identify direct effects of aid on expenditure as these are likely to be mediated by borrowing and tax variations. However aid in Ghana results in increased current rather than capital expenditure, contrary to the evidence from Uganda and Malawi (Fagernas and Schurich, 2004; Fagernas and Roberts, 2004a).

The evidence from Kenya presented in M'Amanja et al. (2005) relates fiscal variables to growth. In particular the authors find that government expenditure has a positive effect on GDP growth while no significant influence is found for tax. Aid disaggregation into grants and loans offers insights into the different effects of these aid components. While grants are positively associated with growth in the long run, loans seem to be treated as a substitute for taxes and to finance fiscal deficits. They therefore have negative effects in the long run. The paper concludes that in the case of Kenya a negative effect of aid on tax effort is a potential obstacle to aid effectiveness and that grants seem to be a preferable aid modality than loans.

Martins (2010) focuses on Ethiopia using quarterly data and disaggregating both expenditure and aid but leaving domestic revenue aggregated (i.e. tax and non-tax revenue). Domestic borrowing is included as well and estimating an identity is avoided by excluding a number of residual items. The paper finds that aid has a positive relation with development expenditure that includes mainly capital expenditure but also certain 'developmental' items under the recurrent heading. In particular aid adjusts to variations in expenditure, thus suggesting that donors follow expenditure decisions of the government by financing increased expenditure. In addition domestic borrowing is found to be the most adjusting item thus compensating for variations in aid and other revenues. Finally no evidence is found for the idea that aid discourages tax effort in Ethiopia and the government finances its expenditure with revenues in the following order: domestic revenue, aid and borrowing.

Finally the most recent CVAR paper on fiscal dynamics is included in Bwire's PhD thesis (2013) on Uganda. The author finds that aid in Uganda is associated with beneficial policy responses and particularly with increased spending and tax effort, and decreased borrowing. Moreover the paper finds that tax revenue is the main driver of spending plans, thus being the main pushing force in the system. Contrary to Osei et al. (2005), the exogeneity of aid cannot be empirically supported in the case of Uganda. Finally the order of preference for resources to finance the budget is in line with the results in Martins (2010) and namely domestic revenue, aid and domestic borrowing.

Therefore, whilst the discussed studies do not find much negative fiscal effects of aid, they show that the underlying mechanisms differ across countries and thus justify the case-study approach.

4.3 Data

Data availability and reliability is often a major problem in African countries and even more so when time series are concerned. This problem is further exhacerbated by the use of CVAR which is by definition an approach highly reliant on the data rather than on economic theory.

Given the uniqueness of Ethiopia's history of national independece (see chapter 2), modern fiscal institutions have a longer history than in other African countries. The reform process started by Emperor Haile Selassie in the 1940s had fiscal policy at its core (see chapter 2 for more details), and indeed early fiscal data dates back to 1949. The efforts for data collection, also reinforced by monitoring needs in the context of multi-year development plans, led to the establishment of the Central Statistical Office in 1961. By that time, which also corresponds to the beginning of our sample, Ethiopia had a well-established tradition in collecting data, particularly fiscal data. In fact today Ethiopia has the highest Statistics Capacity Index in Africa, together with South Africa (OECD and African Development Bank Group, 2010).

Our Ethiopian dataset includes 50 annual observations from 1960 to 2009[7] and it was compiled in Ethiopia on the basis of data from the Ministry of Finance and Economic Development (MOFED). To the best of our knowledge, this is a longer series of annual data than any other study in the literature. Using exclusively national data sources has several advantages. First of all, the data is more likely to be consistent as it comes from a single source. Secondly, it is the one used for government decision making and it is therefore relevant from a policy perspective. Finally, it includes a measure of aid that represents the portion included in the government's budget. We believe this is the most relevant component when assessing the fiscal effects of aid as it is most directly related to fiscal variables, as well as being the one that the government is fully aware of.

Note that in considering budget aid we include budget support but also other sources of aid that flow through the budget. In particular budget support was withdrawn in 2005

[7]The Ethiopian calendar year starts in September and it is 7 years behind the Gregorian calendar. These years therefore correspond more precisely to 1960/61 and 2009/2010 in the Gregorian calendar.

due to the tensions in the aftermath of the elections and it has never been restored since then. However other types of aid have been introduced and most notably the Protection of Basic Services (PBS). While PBS is a project, it flows through the budget and it fully uses the country systems thus having some similarities with general budget support. While only budget aid is considered, it is still possible to further disaggregate it into grants and loans.

Furthermore total expenditure can be disaggregated into capital and recurrent. We keep this distinction without further manipulation although that would be possible along the lines of Martins (2010). While the distinction between developmental expenditure and pure government consumption is theoretically appealing, it is very difficult to impute single expenditure items to one or the other broad category. An obvious example is the one of salaries for employees in the public sector. Some components of this item may be considered developmental expenditure while others may be pure consumption. While some simple distinctions can be made (e.g. recurrent expenditure in health and education) it is not obvious which items should be labelled as developmental and which ones as consumption expenditure. We therefore prefer to keep the original government's classification as a basis for disaggregation of public expenditure.

Finally we disaggregate domestic revenue into tax and non-tax revenue, that we show display rather different characteristics. Domestic borrowing is excluded because a full series is only available from 1974. Moreover its inclusion would not be possible given the log transformation discussed in the next paragraph.

Variables are usually included in a CVAR system either in levels (Bwire, 2013; Martins, 2010; Osei et al., 2005) or in logarithmic transformation (Juselius et al., 2011; M'Amanja et al., 2005). Both options are explored and a logarithmic transformation is eventually chosen since it is superior in terms of model fit, as well as autocorrelation and normality in the residuals.

The log transformation does not pose any problem as long as the variables are strictly positive and not too close to zero. This is the case for all variables except for the first three years of the grants series that reports values very close to zero. These first three years are therefore dropped from the sample. The inclusion of domestic borrowing would indeed represent a challenge in the log transformation since it presents several negative values.

Finally, all the series are tested for trend-stationarity and particularly using the Augmented Dickey-Fuller, the Kwiatkowski-Phillips-Schmidt-Shin and the Clemente-Montanes-

Reyes tests. The first two test for trend-stationarity while the last one allows, and estimates the date of, structural breaks in the single series. The tests provide enough empirical evidence to treat all series as I(1) and the results are shown in appendix 4.A[8].

4.4 Descriptive statistics and context

This section describes the variables underlying the analysis, namely the fiscal variables transformed in logs. The discussion focuses only on the elements emerging particularly from figures 4.4.1 and 4.4.2 that are relevant for the CVAR modelling and for the interpretation of results, while a more complete historical account is reported in chapter 2.

Two major events occurred during the period and namely the regime changes in 1974 and 1991, respectively from the Imperial regime of Haile Selassie to the military junta known as the Derg, and from the Derg to the Ethiopian People's Revolutionary Democratic Front (EPRDF). The differences between these three regimes are likely to influence our analysis and they are therefore taken into account by allowing for two regime shifts in 1974 and 1991.

As far as budget dynamics are concerned, it is important to note that the conception of government budget in Ethiopia was already present well before the start of our sample. However it is only in the early 1940s that the modern institutions of Ethiopia are set up, including those related to fiscal policy, mainly driven by the need for reconstruction and development following the end of the Italian occupation (more details available in chapter 2).

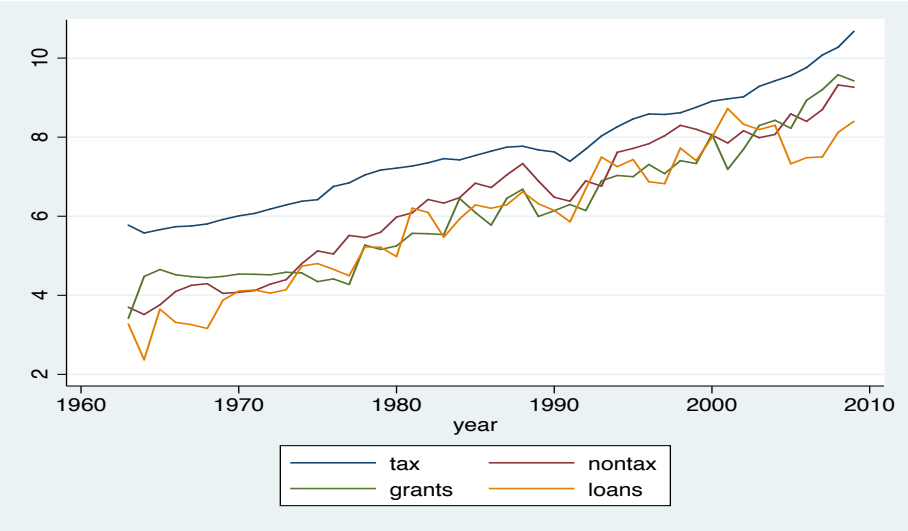
The Derg regime came to power in 1974 following a socialist revolution against the exploitative feudal system of the Imperial period (more details available in chapter 2). Perhaps because of its coercive methods and its strategy of terror, the Derg could extract increasing domestic revenue motivated primarily by expanded military expenditure and an increasing role of the state in the economy. Indeed figures 4.4.1 and 4.4.2 show that both domestic revenues and expenditure increased in the second half of the 70s.

These initial fiscal gains however were later eroded by the Derg's poor economic policies and by military losses in the late 80s. This resulted in a deteriorating fiscal situation at

[8] A note is due on loans and tax. The former seems to show trend-stationarity according to the Augmented Dickey-Fuller test when using 1 lag. At higher lags and in the other two tests the series results to be I(1). The latter seems to still be non-stationary in first difference when using the Augmented Dickey-Fuller tests. However the *kpss* test with lags and the *clem* tests show evidence for tax being I(1). Therefore we believe we have enough evidence to proceed by treating all series as I(1).

the end of the 1980s that appears clearly in figures 4.4.1 and 4.4.2. Both revenues and expenditures decreased, including foreign grants and loans. The decline in international assistance was due to a 'wait and see' attitude of donors that were not willing to support a government that grew increasingly oppressive and whose days were deemed numbered. The fiscal collapse of the late 80s is reflected also in a deterioration in budget balance at that time.

Figure 4.4.1: Trends in domestic and foreign revenue



Source: Authors' calculations based on data provided by the Ministry of Finance and Economic Development

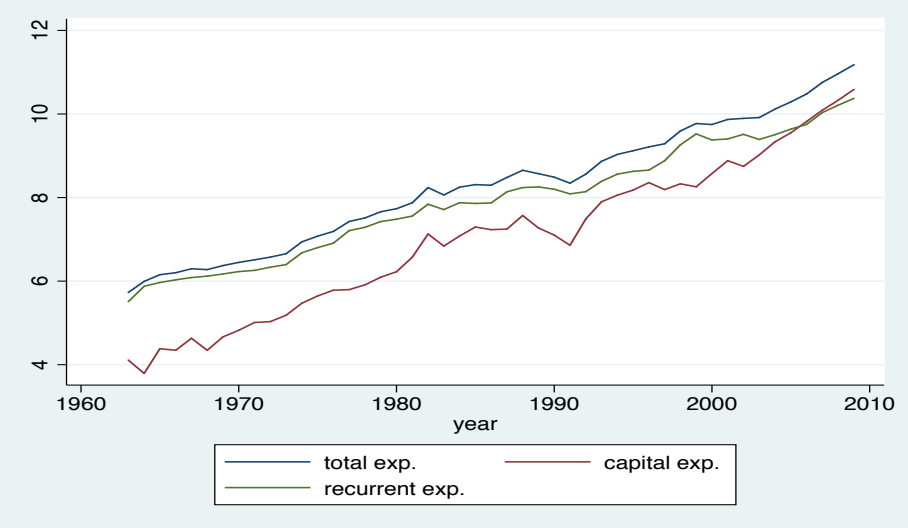
Foreign aid still flowed to Ethiopia under the Derg, including from Western donors (see chapter 2 for more details). Indeed figure 4.4.1 shows that both foreign grants and loans increased rather markedly in the late 70s in correspondence with scaled up Soviet aid, also aimed at supporting the Derg in the Ogaden war against Somali groups.

When the EPRDF took power in 1991, it had already a long history as an organized guerrilla movement (particularly the TPLF, see chapter 2 for details). This high level of internal organization and the strength of the existing Ethiopian institutional apparatus allowed the new government to take over the public administration with little disruption. This is confirmed in figures 4.4.1 and 4.4.2 that show both domestic revenue and expenditure recovering rather quickly after the change of regime.

The EPRDF was supported in the reconstruction and economic adjustment process by Western donors, particularly by the International Financial Institutions that contributed through Structural Adjustment Programs (SAPs) in the 90s. Indeed an increase in loans appears rather clearly in figure 1. However the eruption of the conflict with Eritrea in 1998 triggered a 'peace conditionality' that resulted in many donors leaving Ethiopia until the

armed confrontation ended in 2000/2001. This year was also marked by a famine particularly in the Somali region, that donors responded to with great delay due to the conflict. The peace conditionality resulted in increased deficit during the war years, used not only to finance military expenditure but also to face the food shortages. The decrease in loans following the peace conditionality and the subsequent increase once such conditionality was lifted in the early 2000s, are both visible in figure 4.4.1.

Figure 4.4.2: Trends in public expenditure



Source: Authors calculations based on data provided by the Ministry of Finance and Economic Development

4.5 The methodology: CVAR

The CVAR methodology is used here to analyse budget dynamics in the context of a budget identity such as the one reported in equation 4.1.

$$TAX + NONTAX + LOANS + GRANTS + BOR = REXP + CEXP \quad (4.1)$$

The CVAR methodology is particularly useful in the analysis of budget dynamics for at least two reasons. Firstly the mechanism for the budget process does not have to be specified *a priori*, and therefore the CVAR can let the data speak on the dynamics that drive the process. In this sense the CVAR is a-theoretical. This is a clear advantage with respect to the fiscal response literature, that assumes the existence of targets that the government would like to meet and that drive the process. However the existence of such targets and the mechanism for setting them are not based on empirical analysis

or testing. Secondly the CVAR methodology does not require the *a priori* distinction between exogenous and endogenous variables that instead can and will be tested. This is particularly relevant as regards the endogeneity of aid that is a common concern in the tax effort literature.

Besides these advantages, it is important to note that this methodology has also a few caveats. First of all the CVAR is very demanding on the data and therefore the number of variables should be as limited as possible to allow estimation and inference, particularly in small samples. Moreover the CVAR lends itself to the"build-up of type I errors in a general-to-specific modeling strategy" (Lloyd et al., 2009). Finally the results are often largely dependent on the chosen model and since different researchers may choose different ones, they could potentially reach different conclusions (Lloyd et al., 2009). For this reason we estimate a number of models that are alternative to our preferred specification (mostly reported in the appendix) and that support the robustness of our results.

The CVAR is also a good method for analyzing time series that are trending, as they are in our case (see figures 4.4.1 and 4.4.2). This trending behavior and the presence of a unit root in our series may give rise to cointegration (i.e. stationary combinations of system variables). When this is the case, it is possible to separate the long run (LR) and short run (SR) dynamics, as well as to test the existence of LR equilibrium relationships. Moreover the CVAR framework allows for a rich set of tests to make sure the model is specified correctly and to test all the assumptions that are normally imposed a priori, most notably exogeneity.

Using the data described in section 4.3, we therefore analyze fiscal dynamics in Ethiopia using a cointegrated VAR (CVAR) model, or vector error correction model (VECM). The basic VAR framework is based on the estimation of a set of simultaneous equations, one for each variable in the system, where the explanatory variables are the lags of the dependent variable and of all the other variables in the system. All variables are treated as potentially endogenous.

4.5.1 The unrestricted VAR

We first formulate a five-dimensional VAR(k) model where $k = 1, \ldots, t-k$ and $x_t = [exptot, tax, nontax, grants, loans]$, the lower case indicating logs of the original variables and k the selected lag length. The unrestricted VAR model is essentially a reformulation

of the covariances in the data[9] and it can be summarized as follows:

$$x_t = \Pi_1 x_{t-1} + \cdots + \Pi_k x_{t-k} + \Phi D_t + \epsilon_t \quad t = 1, , T \tag{4.2}$$

where x_t is a $p \times 1$ vector of endogenous variables, with $p = 5$ in our case; D_t is a vector of deterministic components (such as a constant μ, a trend, and dummy variables) with a vector of coefficients Φ; k denotes the selected lag length; ϵ_t is a $p \times 1$ vector of unobservable error terms, that are assumed to be serially uncorrelated, have a zero mean, a time-invariant positive definite covariance matrix Ω, and are $IN_p(0, \Omega)$; and Π_k are $p \times p$ matrices of coefficients to be estimated. Since VAR describes the variation in x_t as a function of lagged values of the process, but not the current values, all information about the contemporaneous effects between the variables is contained in the residual covariance matrix Ω (with dimensions $p \times p$). Note that the $IN_p(0, \Omega)$ assumption about the errors is consistent with economic agents who are rational in the sense that they do not make systematic errors when they make plans for time t based on the available information at $(t-1)$ (Juselius, 2006, p.46).

If the assumption that $X = [x_1, x_2, \ldots, x_T]$ is multivariate normal $IN(\mu, \Sigma)$ is correct, then it follows that the k$^{\text{th}}$ order VAR process is linear in parameters; has constant parameters; and has normally distributed errors ϵ_t (Juselius, 2006, p.45-46). These assumptions can and will be tested in section 4.6. If the tests reveal that the model does not satisfy the assumptions it is possible to modify it to achieve a 'well behaved' version, for example by including dummies or by changing the measurement of the variables (Juselius, 2006, p.47). Following this procedure, we finally obtain a well specified model so that reliable statistical inference can be ensured[10].

4.5.2 VECM representation of the VAR

In presence of non-stationarity in the variables, the VAR can be specified in terms of their first difference and that would be stationary if x_t is integrated of order 1, i.e. $x_t \sim I(1)$. The VECM representation of the VAR includes both the stationary first difference of

[9] The parameters $[\Pi_1, \Pi_2, , \Pi_{(T-1)}] = \Sigma_{12}\Sigma_{22}^{(-1)}$ where Σ_{12} represents a covariance matrix between $y_{(1,t)} = x_t$ and $y_{(2,t)} = x_{(t-1)}, x_{(t-2)}, \ldots, x_1, X_0$ (where X_0 is the vector of initial values). This illustrates that VAR is essentially a reformulation of the covariances in the data (Juselius, 2006, p.46).

[10] "Simulation studies have shown that valid statistical inference is sensitive to violation of some of the assumptions, such as parameter non-constancy, autocorrelated residuals (the higher, the worse) and skewed residuals, while quite robust to others, such as excess kurtosis and residual heteroscedasticity" (Juselius, 2006, p.47).

variables in $x_t(\Delta x_t)$ and their value in levels (x_t), thus preserving both the long run and short run information in the data. In particular the error correction form of the VAR (VECM or CVAR) is represented by the following equation:

$$\Delta x_t = \Pi x_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta x_{t-i} + \Phi D_t + \epsilon_t \tag{4.3}$$

where Π and Γ_i are matrices of, respectively, long run and short run coefficients[11]; and $\epsilon_t \sim IN(0, \Omega)$.

The VECM representation illustrates that if variables are found to be I(1), and macroeconomic variables usually are, we are regressing stationary variables (Δx_t) on unit-root processes (x_{t-1}). In such case, the estimated coefficients are spurious. However, if some variables in the system are driven by the same persistent shocks, there may exist linear combinations of these variables that are integrated of the lower order than the variables themselves (i.e. I(0)). These linear combinations would represent cointegrated relations, βx_t, and could be interpreted as the long-run steady-state relationships. When cointegration exists, Π has reduced rank $r < p$ and it is defined as follows:

$$\Pi = \alpha\beta \tag{4.4}$$

where α and β are $p \times r$ matrices (with $r < p$), βx_t defines the stationary long-run cointegrating relationships $(r \times 1)$, and α denotes the adjustment coefficients to the equilibrium error. Intuitively, if all $x_t \sim I(1)$ and $\Delta x_t \sim I(0)$, then a full rank in Π would be logically inconsistent as it would imply that x_t must be stationary[12]. On the other hand $r = 0$ implies that each variable in x_t is non-stationary and it is driven by its own individual stochastic trend and therefore no cointegration exists. In this case a simple VAR model with the variables in first difference would not imply any loss in long run information.

The determination of r, the cointegration rank, is discussed in section 4.7. This choice is crucial for all the subsequent estimation and for the economic interpretation of the results. Indeed the r cointegrating relations can be interpreted as steady state equilibrium relations to which the system adjusts. The identification of these relations and their parameters α and β, i.e. the long run structure, is discussed in section 4.8. Furthermore

[11] In particular, $\Pi = \sum_{i=1}^{k} \Pi_i - I_p$ and $\Gamma_i = -\sum_{j=i+1}^{k} \Pi_j$ with $i = 1, \ldots, k-1$.

[12] The VECM representation of the VAR with full rank in Π and $x_t \sim I(1)$ would imply that a stationary variable Δx_t equals a non stationary variable x_{t-1}, lagged stationary variables Δx_{t-1} and a stationary error term. Since a stationary variable cannot equal a non-stationary variable, either $\Pi = 0$ or it would have reduced rank.

the long run structure is identified by imposing restrictions on the cointegrating relations. In order to allow inference, each of the LR relations requires one normalization and $r-1$ restrictions on the β coefficients.

Expressing the VAR in its VECM form allows identifying long run relations, or the steady state to which the process is pulled, defined by $\beta x_t - \beta_0 = 0$. The forces α represent adjustment and they activate as soon as the process is out of steady state, i.e. when $\beta x_t - \beta_0 \neq 0$. The VECM can be complemented with a moving average (MA) representation that identifies the pushing forces of the system. However in our case a clear identification of the MA side is not feasible, as discussed in appendix 4.B.

4.6 The UVAR: specification and misspecification tests

This section is concerned with the specification of the unrestricted VAR (UVAR) model and the related misspecification tests. First, we choose and justify the deterministic components D_t including constant terms, trends and dummy variables. Secondly we assess the necessary lag length k and we test for misspecification, particularly focusing on the analysis of residuals. Finally we check for goodness of fit and for parameter constancy.

Note that "the residual autocorrelation tests and the ARCH tests are derived under the assumption of normally distributed errors and the normality tests are derived under the assumption of independent and homoscedastic errors" (Juselius, 2006, p.77). In addition the lag length criteria are only valid under the assumption correctly specified model. Therefore the misspecification test procedure, in search of the correctly specified model, is rather iterative. Following this procedure we finally obtain a well specified model.

4.6.1 Deterministic components

The deterministic components include constant terms, trends and dummy variables. They define the CVAR model specification in a way that influences all the subsequent analysis. This section therefore considers them carefully and it justifies our choice.

As far as the constant terms and trends are concerned, we choose a model where the constant term is unrestricted, therefore allowing a non-zero mean both in the LR and SR relations[13]. The non zero mean in the SR relations, i.e. $E(\Delta x_t) \neq 0$ implies that there are linear trends in the variables. This is consistent with a unit root process in the

[13]There are five possible models to define the constant and trend terms, discussed in Juselius (2006, p.100). The model that fits our data better is model three, which is described in this section.

variables where $x_t \sim I(1)$ and $\Delta x_t \sim I(0)$. However there is neither a trend in the SR equations nor in the cointegrating space, meaning that the trends in the variables cancel out in the cointegrating relations. This is indeed our case, as confirmed in the analysis of residuals carried out in the next sections. In addition the exclusion of a trend from the cointegrating space is discussed in section 4.8.1 and the results from the exclusion test confirm the validity of this choice.

As far as dummy variables are concerned, three types can be considered: a mean shift dummy $(0, 0, 0, 1, 1, 1,)$, a permanent intervention dummy $(0, 0, 0, 1, 0, 0,)$, and a transitory shock dummy $(0, 0, 0, 1, -1, 0, 0,)$[14]. Capturing significant interventions and events with dummies allows avoiding large residuals that may result in a violation of the normality assumption. There are two main ways to decide on what dummies to include: to set them according to knowledge of events that are significant enough to have to be taken into account in the model or, in case such a priori knowledge is not available, to look at large residuals in the data (for the latter see section 4.6.3). In the case of Ethiopia between 1960 and 2009 it is rather straightforward to identify two important shifts corresponding to the political regime changes of 1974 and 1991. These events are likely to influence the analysis due to the radical shift in some policies between successive regimes (details available in chapter 2). However it is important to note that although change and transformation has undoubtedly occurred in Ethiopia in both regime shifts, there are some important elements of continuity (see section 4.4 and chapter 2).

Therefore, once they are taken into account using regime shift dummies, the two shifts do not impair the validity of our statistical analysis. The first shift dummy takes value of 1 after 1974 and zero otherwise, and the second shift dummy is 'switched on' in 1991 (taking a value of one thereafter and zero beforehand).

While we are confident that the deterministic components discussed here are well specified, we also test the robustness of our results to different choices. Our main results do not change when we specify differently the constant and trend terms as in the next most plausible option[15]. Moreover they do not change substantially when we consider other dates for the regime shifts, namely the years immediately before or after the chosen ones.

[14] See Juselius (2006, p.102).
[15] This would be model two in the discussion in Juselius (2006, p.100).

4.6.2 Lag length determination

Having included the deterministic components discussed in the previous section, we now turn to the lag length determination of such specified model. Including the correct deterministic components at this stage is necessary because the lag length determination tests are only valid under the assumption of a correctly specified model, in terms of regime shifts and constant parameters[16] (Juselius, 2006, p.71). We use the standard lag length determination procedure that relies on a likelihood ratio lag reduction test and on two information criteria (Juselius, 2006, p.71).

The lag reduction test compares the null hypothesis of lag truncation at k against the alternative hypothesis of $k+1$. Accepting the null implies that there are no significant coefficients at lag $k+1$. The test uses the effective sample size, therefore the number of observations available when using the maximum lag length considered. We consider a maximum of five lags and therefore the effective sample for the test is 1968-2009. Note that Juselius (2006, p.72) argues that "a lag length of two is in most cases sufficient to describe a very rich dynamic structure even in a small-dimensional system" and we are therefore comfortable with testing a maximum lag of five. As shown in table 4.6.1 the lag reduction test always rejects the null, therefore suggesting the maximum lag length (5). However the test does not use any penalizing factor for additional parameters to be estimated and it is therefore not particularly suitable in small samples.

Instead the information criteria (IC) reported in table 4.6.2, namely Schwartz (SC) and Hannan-Quinn (H-Q), include different penalizing factors related to the additional number of parameters required by adding more lags. The SC criteria suggests a lag length of one, while the H-Q criteria suggests ($k=3$)[17]. The LM tests, reported in the last two columns of the same table, indicate the presence of 'left-over' residual autocorrelation at $k=1$ with a p-value of 0.055. This would violate the basic assumptions of the model and indeed when we try to estimate an unrestricted VAR (UVAR) with $k=1$ and $p=5$ we find an unsatisfactory model specification since multivariate normality is rejected, as it is the null of homoscedastic errors of order one and two (see misspecification tests for UVAR(k=1) in appendix 4.C). At the lag length of two the LM test does not detect any autocorrelation. Moreover ($k=2$) seems to provide a good description of the data generating process as well as satisfactory results from misspecification tests (see sections 4.6.4 and 4.6.5). Given this information and our preference for simple models to preserve

[16] Constancy in the parameters is checked in section 4.6.7 and largely confirmed.
[17] The lag length corresponding to the highest value of the IC is the suggested one.

degrees of fredom, we select $k = 2$.

Table 4.6.1: Lag reduction test

Test	Test stat	p-value
VAR(4) << VAR(5)	ChiSqr(25) = 85.214	0.000
VAR(3) << VAR(5)	ChiSqr(50) = 124.005	0.000
VAR(3) << VAR(4)	ChiSqr(25) = 38.792	0.039
VAR(2) << VAR(5)	ChiSqr(75) = 198.140	0.000
VAR(2) << VAR(4)	ChiSqr(50) = 112.927	0.000
VAR(2) << VAR(3)	ChiSqr(25) = 74.135	0.000
VAR(1) << VAR(5)	ChiSqr(100) = 259.290	0.000
VAR(1) << VAR(4)	ChiSqr(75) = 174.076	0.000
VAR(1) << VAR(3)	ChiSqr(50) = 135.284	0.000
VAR(1) << VAR(2)	ChiSqr(25) = 61.149	0.000

Note: H_0 is the valid truncation at k, vs. the alternative of $k + 1$.

Based on the deterministic components and lag length discussed in the previous two sections, an UVAR is estimated and it is the basis of the following misspecification tests. While the preliminary estimates from the UVAR can be indicative, they still offer only a rough picture. We therefore do not comment them here but only report the results in appendix 4.D.

Table 4.6.2: Information criteria for lag length determination

Model	k	T	Regr	Log-Lik	SC	H-Q	LM(1)	LM(k)
VAR(5)	5	42	30	513.591	-11.108	-15.039	0.149	0.579
VAR(4)	4	42	25	470.985	-11.304	-14.580	0.678	0.161
VAR(3)	3	42	20	451.589	-12.605	-15.226	0.315	0.483
VAR(2)	2	42	15	414.521	-13.065	-15.030	0.268	0.143
VAR(1)	1	42	10	383.947	-13.834	-15.144	0.055	0.055

Note: SC is the Schwarz criterion; H-Q is the Hannan-Quinn criterion; LM(k) is the LM-test for autocorrelation of order k, with H_0 = no autocorrelation. P-values are reported in the LM(k) column.

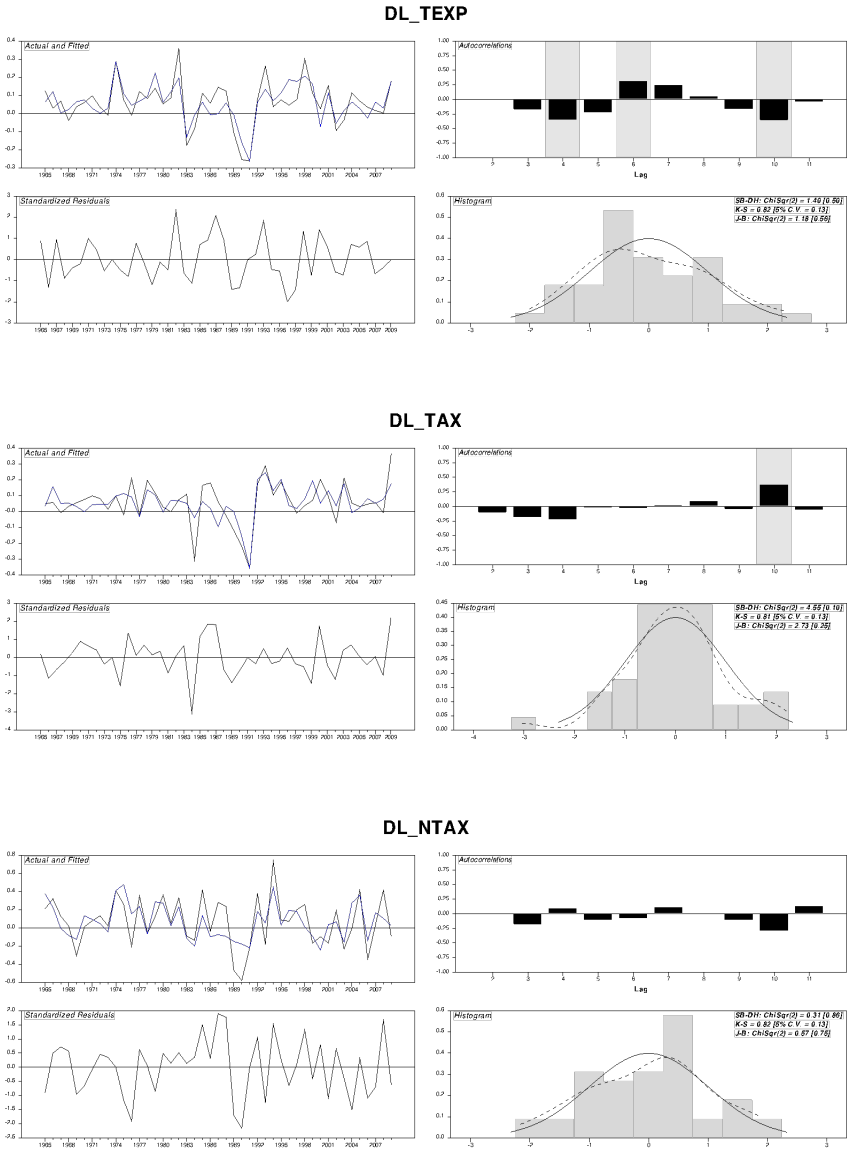
4.6.3 Residual plots

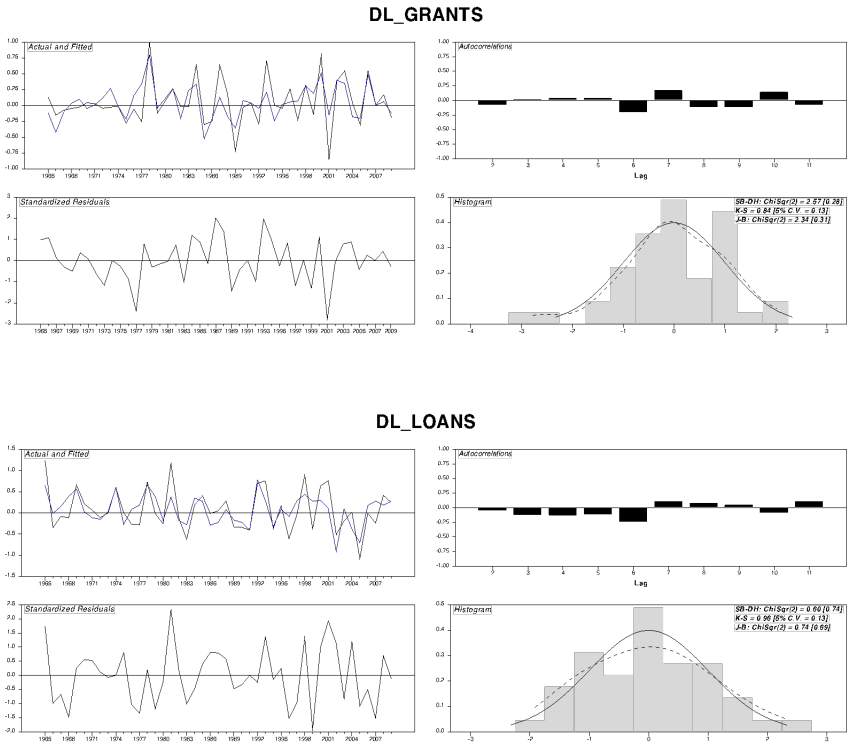
It is useful to start the analysis of the residuals with a graphical inspection of the output provided by RATS/CATS (but also PcGive). This graphical analysis often provides additional information with respect to formal tests and it is particularly important in small samples where the formal tests may fail to capture all potential issues.

For each equation of the five-dimensional UVAR specified above (five variables, or $p = 5$), figure 4.6.1 shows the following graphs: the plots of actual and fitted values of

$\Delta x_{i,t}$, $i = 1, \ldots, p$ (top left panel); the autocorrelogram of order 11 (top right panel); the standardized residuals (bottom left panel); and the empirical and normal distributions (bottom right panel). The graphs do not signal any particular issues. However it is worth noting that larger residuals can be identified for grants and loans during the war with Eritrea between 1998 and 2001 when donors partly left the country because of their disagreement over the war. The 1983/84 famine can also be spotted in terms of a large residual in some of the graphs. These events may be good candidates for transitory shock dummies in case they pose problems for normality. However this does not seem to be the case here, as shown in section 4.6.5, and we therefore prefer a parsimonious specification that does not include these dummies.

Figure 4.6.1: Residual plots





4.6.4 Residual autocorrelation

As the VAR methodology is based on the idea of decomposing the variation in the data into a systematic part describing the dynamics in the model and an un-systematic random part, the assumption of uncorrelated residuals, and hence its test, is an important one. In addition all the χ^2 and F tests are derived under the assumption of independent errors, the violation of which would result in the distribution of these tests deviating from χ^2 and F in unknown ways (Juselius, 2006, p.74).

The key test used to detect residual autocorrelation is the LM test of j$^{\text{th}}$ order autocorrelation, calculated using an auxiliary regression of estimated VAR residuals, $(\hat{\epsilon}_t)$, on the k-lagged variables, $x_{t-1}, x_{t-2}, \ldots, x_{t-k}$, and the j$^{\text{th}}$ lagged VAR residual $(\hat{\epsilon}_{t-j})$. The LM test is then calculated as a Wilks ratio test with a small-sample correction and it is approximately distributed as χ^2 with p^2 degrees of freedom where p is the number of variables in the model[18]. H_0 assumes no (left-over) autocorrelation in the residuals.

Intuitively if the test suggests that there are significant autocorrelations left in the model, agents' plans for t based on the information available at $t-1$ would deviate systematically from the actual realizations (Juselius, 2006, p.74). The results in table 4.6.3 show no residual autocorrelation up to the 4$^{\text{th}}$ order.

[18]For more details see (Juselius, 2006, p.74).

Table 4.6.3: Autocorrelation test

Test	Test statistic	p-value
LM(1)	ChiSqr(25) = 30.981	0.190
LM(2)	ChiSqr(25) = 29.974	0.225
LM(3)	ChiSqr(25) = 32.086	0.156
LM(4)	ChiSqr(25) = 17.479	0.864

Note: H_0 is no autocorrelation.

4.6.5 Residual heteroskedasticity and normality tests

The test for residual heteroskedasticity is the m^{th} order ARCH test described in (Juselius, 2006, p.74). Tables 4.6.4 and 4.6.5 show that no ARCH effects were detected respectively at multivariate or univariate level, as the null of homoscedastic errors can never be rejected.

Table 4.6.5 also shows univariate normality tests where the null of normality could never be rejected, also confirming that it is not necessary at this point to include transitory shock dummies to account for large residuals. The null of multivariate normality cannot be rejected, with p-value 0.111. While this p-value is not particularly far from the 10% threshold, our results do not indicate any particular departures from normality in terms of skewness (expected to be around 0) or kurtosis (expected to be around 3) in the univariate tests[19].

Table 4.6.4: Multivariate heteroskedasticity and normality tests

Test	Test statistic	p-value
	Test for ARCH	
LM(1)	ChiSqr(225) = 218.679	0.606
LM(2)	ChiSqr(450) = 483.740	0.131
LM(3)	ChiSqr(675) = 689.582	0.340
LM(4)	ChiSqr(900) = 675.000	1.000
	Test for normality	
	ChiSqr(10) = 15.635	0.111

Note: H_0 is homoskedastic errors for the LM tests and normally distributed errors for the ChiSqr test.

[19] Juselius (2006, p.76-77) notes that VAR estimates are more sensitive to deviations from normality due to skewness than to excess kurtosis.

Table 4.6.5: Univariate heteroskedasticity and normality tests

Variable	Skewness	Kurtosis	ARCH(2)	Normality	R^2
exptot	0.323	2.491	0.078 (0.962)	1.402 (0.496)	0.677
tax	-0.212	3.874	1.408 (0.490)	4.547 (0.103)	0.571
nontax	-0.125	2.438	3.078 (0.215)	0.310 (0.856)	0.509
grants	-0.425	3.482	0.114 (0.945)	2.566 (0.277)	0.511
loans	0.193	2.437	2.578 (0.276)	0.599 (0.741)	0.518

Note: p-values in parenthesis when relevant. H_0 is homoskedastic errors for the ARCH tests and normally distributed errors for the normality test.

4.6.6 Goodness of fit

The measure for goodness of fit in the VAR model is the trace correlation, defined in Juselius (2006, p.73). The trace correlation for our model is 0.518 and it can be roughly interpreted as an average R^2 for the p VAR equations. CATS also calculates an R^2 for each of the p equations and these are reported in table 4.6.5. Indeed when the variables are integrated of order one, the R^2 is only meaningful when the dependent variable is given as Δx_t.

4.6.7 Parameter constancy

Since parameter constancy is a pre-requisite for lag length determination and a useful feature for the model, we carry out a battery of tests based on the model specified so far[20]. For details on the tests we refer to Juselius (2006, p.150). When discussing parameter constancy, "it is also important to realize that it is just a question of looking carefully enough to find non-constancy in at least some directions of essentially any empirical model. The important issue is whether the deviation from constancy is serious enough to warrant a re-specification of the model" (Juselius, 2006, p.150). In our case the parameter constancy tests do not show evidence of non-constant parameters.

4.7 Determination of cointegration rank

The determination of cointegration rank r is crucial in the CVAR analysis, as it influences all the subsequent econometric analysis by dividing the data into r pulling and $p-r$ pushing forces, corresponding respectively equilibrium relations and common driving trends.

[20]Results not reported here for simplicity.

In other words the testing procedure aims at discriminating between the stationary (equilibrium) and the non-stationary relations.

The choice of cointegration rank is usually a difficult decision and in the context of developing countries it is aggravated by small samples. It is therefore preferable to consider additional information in addition to the formal test procedure (Juselius, 2006, p.131). In the next sections we consider all the available information for determining the cointegration rank.

4.7.1 The Johansen test

The Johansen test, also called trace test or LR test, is the formal test procedure. It is based on the concentrated form of the VAR model (or R-form) where all short-run dynamics and deterministic components are concentrated out using the Frisch-Waugh theorem[21]. The procedure then is to test the hypothesis $H_r : rank = r$, implying that there are at least $p-r$ unit roots and r cointegrating relations. If the test statistic exceeds the critical value, we reject the hypothesis of $p - r$ unit roots and r cointegrating relations, and conclude that there are fewer unit roots and more cointegrating relations in the model.

The distribution of the LR test is non-standard and it is influenced by the deterministic components of the VAR model. It therefore has to be simulated using our specified model in order to obtain critical values. Table 4.7.1 reports the simulated distribution for each H_r and table 4.7.2 reports the Johansen test results. Juselius (2006, p.140-141) argues that in small samples the asymptotic distributions are generally a poor approximations to the true distributions and can therefore result in substantial size and power distortions. Therefore we apply also the small sample Bartlett corrections to the trace statistic (see Johansen (2002)) that ensure a correct test size and that are indicated by asterisks in table 4.7.2.

The uncorrected trace statistic implies that we cannot reject the hypothesis that there are 2 unit roots $(p - r)$ and 3 stationary relations (r), thus suggesting a rank of 3. The Bartlett-corrected values suggest 3 unit roots $(p-r)$ and 2 cointegrating relations (r), thus a rank of 2. However it is possible to accept this hypothesis only with a borderline p-value of 0.062. Juselius (2006, p.145) suggests that in small samples is better to avoid choosing the rank based on small p-values close to the 5% threshold and therefore imposes some caution in accepting $r = 2$, whereas $r = 3$ would be a safer option. More information is

[21] For more details see Juselius (2006, p.116-17, p.131-145).

explored in the next sections to support this decision.

Table 4.7.1: Quantiles of the simulated rank test distribution

p - r	r	Mean	S.E.	50%	75%	80%	85%	90%	95%
5	0	58.617	10.052	58.135	65.396	67.284	69.383	71.789	75.445
4	1	39.213	8.459	38.395	44.636	46.095	48.066	50.244	54.154
3	2	23.243	6.861	22.499	27.299	28.671	30.263	32.258	35.865
2	3	10.956	4.491	10.305	13.485	14.408	15.503	16.910	19.076
1	4	1.963	1.939	1.364	2.722	3.221	3.782	4.611	5.855

Note: the deterministic specification includes an unrestricted constant and 2 level shifts in 1974 and 1991. Number of replications (N): 2500; length of random walks (T): 400.

Table 4.7.2: Johansen test for determination of cointegration rank

$p-r$	r	Eig.Value	Trace	Trace*	Frac95	P-Value	P-Value*
5	0	0.561	102.992	89.825	75.445	0.000	0.003
4	1	0.459	65.973	57.488	54.154	0.003	0.025
3	2	0.364	38.306	34.598	35.865	0.026	0.062
2	3	0.265	17.927	15.413	19.076	0.075	0.155
1	4	0.087	4.095	3.549	5.855	0.123	0.163

Note: asterisks denote Bartlett-corrected values.

4.7.2 Additional information to determine r

Four additional pieces of information can be used to determine r and namely: the characteristic roots of the model, the t-values of the α coefficients, the recursive graphs of the trace statistic, and the graphs of the cointegrating relations[22].

First, table 4.7.3 reports the $p \times k = 10$ characteristic roots of the model with $r = 3$ and figure 4.7.1 illustrates them in the unit circle. If the third cointegrating vector is non-stationary and therefore wrongly included in the model, then the largest characteristic root will be close to the unit circle. With $r = 3$, the modulus of the largest characteristic root is 0.690 as reported in table 4.7.3. Although in small samples it is difficult to make a sharp distinction between unit roots, near unit roots, and 'very stationary' roots (Juselius, 2006, p.145), we believe that the largest root in our case is far enough from the unit circle not to be considered a unit root[23].

Secondly we look at the t-values of the alpha coefficients of the UVAR. The idea behind this is that ideally we want to lose as little as possible of the information in Π when choosing

[22]For more details see Juselius (2006, p.48-52, 131-145).

[23]Note that the modulus of the largest characteristic root for a model with $r = 2$ is 0.584.

Figure 4.7.1: Illustration of the roots of the companion matrix

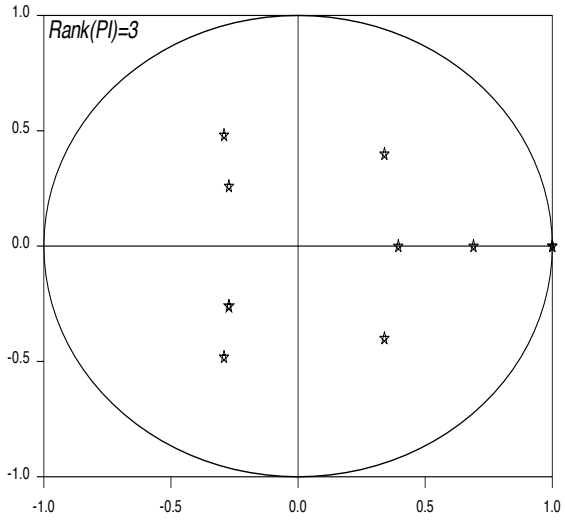


Table 4.7.3: The roots of the companion matrix

	Real	Imaginary	Modulus	Argument
Root1	1.000	0.000	1.000	0.000
Root2	1.000	0.000	1.000	0.000
Root3	0.690	-0.000	0.690	0.000
Root4	-0.291	0.481	0.562	2.115
Root5	-0.291	-0.481	0.562	-2.115
Root6	0.340	0.400	0.525	0.866
Root7	0.340	-0.400	0.525	-0.866
Root8	0.395	-0.000	0.395	0.000
Root9	-0.272	0.260	0.376	2.379
Root10	-0.272	-0.260	0.376	-2.379

r. If all of the t-values of the α coefficients in the r^{th} relation are small, say less than 2.6, then one would not gain a lot by including the r^{th} vector as a cointegrating relation in the model (Juselius, 2006, p.142). The higher critical value is needed because in the UVAR we have not yet established which βx_t vectors are stationary. Since the t-values for the α coefficients corresponding to a non-stationary βx_t are not distributed as a Student's t, it is more appropriate to consider a value between Student's t and Dickey-Fuller's τ (Juselius, 2006, p.122).

Appendix 4.D shows the α coefficients from our basic UVAR. In the third relation (Alpha 3) almost all coefficients are significant and thus show adjustment. Instead in the fourth relation (Alpha 4) only one coefficient may be considered significant. These results show that by choosing $r = 2$, thus excluding the third relation (Alpha 3), we would loose

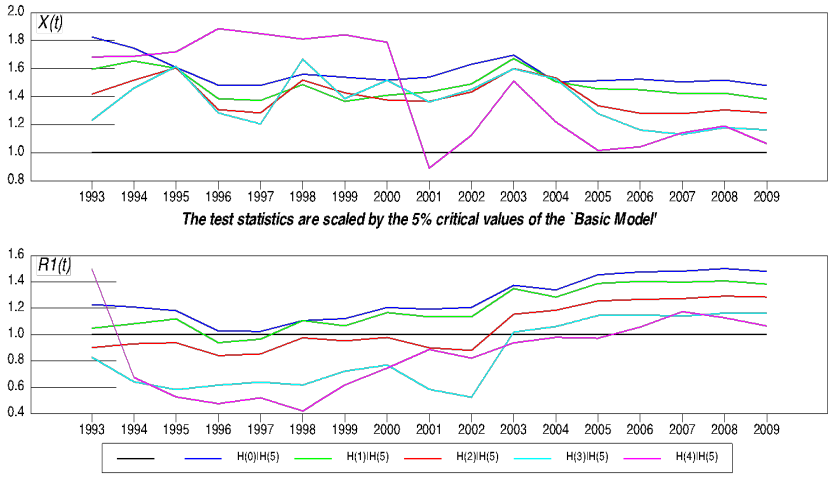
important information. The choice of $r = 3$ seems therefore preferable.

Thirdly we look at the recursive graphs of the trace statistic (figure 4.7.2), noting that the recursively calculated components of the trace statistic (in the lower panel of figure 4.7.2) should grow linearly for all stationary relations (r) but stay constant for the unit root processes ($p - r$) (Juselius, 2006, p.142). The graph contains a unit root rejection line at 1. However for small samples, and accounting for the Bartlett correction, this line should be shifted to approximately 1.25 (Juselius, 2006, p.145). The figure confirms that there are three stationary relations, and thus it supports $r = 3$.

A fourth source of information is provided by the graphs of the possible cointegrating relations from the UVAR (reported in appendix 4.E). In particular if the graph of a supposedly stationary relation shows clear signs of non-stationarity, it may be necessary to reconsider the choice of r or try to re-specify the model. The graphs for the first three Beta relations do not provide strong evidence against a choice of $r = 3$ although Beta(3) is more difficult to judge around 1991.

In conclusion, we are rather confident that a choice of $r = 3$ fits the data reasonably well and it is indeed supported by the majority of tests and evidence presented in this section. This choice is also confirmed by the parameter constancy tests of the model with $r = 3$, that do not signal any particular problem (Juselius, 2006, p.145).

Figure 4.7.2: Trace test statistics



4.7.3 Economic interpretability of the results

One of the elements to consider when evaluating the cointegration rank is the economic interpretability of the results (Juselius, 2006, p.142). This section therefore assesses the

validity of the existence of three cointegrating relations from an economic point of view.

In the introduction to this chapter (section 4.1) we have hypothesised four possible relations of interest, of which only three can be explored here since domestic borrowing is excluded from the analysis. Therefore the existence of three cointegrating relations, supported by the tests and information presented previously in this section, would be economically sensible and consistent with the following three hypothesised relations (as outlined also in the introduction, section 4.1). Note that these relations are still hypothetical and their empirical validity is tested in the next section, on identification of the long run structure, where we also define their exact specification.

- A domestic budget equilibrium where the government makes its spending decisions consistent with the planned domestic revenue. Whether aid is part of this equilibrium can and will be tested.

- A relationship between government spending and aid, which we can expect to be positive. Formulating an equilibrium relation between these variables would also allows us to test hypotheses about aid spending and to identify the adjusting variables. In particular it is interesting to test whether it is government expenditure or aid that adjusts to deviations from this equilibrium relationship.

- A relation between aid variables and tax revenue. In particular if such a long-run relation exists, it would be possible to test whether there exists a disincentive effect of aid on tax. In addition, by disaggregating grants and loans we can test whether aid heterogeneity matters.

4.8 Long run identification

So far we have defined a specified model for the underlying UVAR model with 5 endogenous variables, including the deterministic components discussed in section 4.6.1, lag length $k = 2$ and cointegration rank $r = 3$. In addition we have shown that such specified model complies with the basic assumptions of the VAR model in terms of normality and other required properties of the residuals. Based on this UVAR, this section focuses on the identification of a long run structure for the CVAR that includes three cointegrating relations, consistent with the choice of $r = 3$.

In particular we test hypotheses on both α and β coefficients. On the one hand the former set of coefficients indicates adjustment to the equilibrium relations and it can also

offer insights on weak exogeneity. If one or more variables are found to be weakly exogenous, it is possible to proceed with partial models in the well-specified long run structure of the CVAR[24]. On the other hand, β coefficients define the long run equilibrium relations to which the system is pulled back when it is out of steady state. By testing hypotheses on β we can test for LR exclusion, stationarity of single variables and of relations between variables. The latter is equivalent to testing the existence of long run equilibrium relations. It also allows us to identify the possible identifying and over-identifying restrictions to be imposed on the cointegrating relations and thus give indications on the LR structure.

4.8.1 Long run exclusion

The possibility that some variables should be excluded from the LR structure can be explored through a test for a zero row restriction on β. If this hypothesis is accepted, the variable can be excluded from the cointegration space without losing information. More formally, the likelihood ratio procedure tests the null of a zero restriction for one variable on all β vectors ($\beta = 0$) against the alternative of no restriction on β ($\beta \neq 0$)[25].

Table 4.8.1 reports the test statistic and the associated p-value for the long-run exclusion for each variable for all possible choices of r. For our choice of cointegrating rank, $r = 3$, the long-run exclusion tests suggest that none of the endogenous variables should be excluded from the cointegrating space and thus from the long-run relations. There is, however, some borderline evidence for potential long-run exclusion of the 1991 shift dummy[26]. Given the p-value of 0.055, very close to the 5% threshold, we decide to keep this dummy in the LR system. This choice is confirmed by looking at the Π matrix from the estimated UVAR (see appendix 4.D) that provides no clear signs for any of the variables or shift dummies to be excluded since their coefficients are significant for at least one equation. Moreover the inclusion of both dummies is justified by qualitative information on the two regime shifts in the Ethiopian context (see chapter 2).

Finally, the exclusion test can also be used to confirm the validity of our choice to exclude a trend from the cointegrating space (see section 4.6.1 on deterministic components). This test confirms that the trend is not required for our specified system for any choice of r.

[24] Partial models would treat the identified exogenous variables explicitly as such in the empirical model.
[25] Note that this test does not impose identifying restrictions yet.
[26] The acceptance of exclusion of the shift dummy form the cointegrating relations would imply that the mean shift cancels out in the cointegrating relations.

Table 4.8.1: Test of LR exclusion

r	5% C.V.	exptot	tax	nontax	grants	loans	1991	1974
1	3.841	6.988	3.820	0.083	6.348	6.432	0.023	7.748
		(0.008)	(0.051)	(0.773)	(0.012)	(0.011)	(0.880)	(0.005)
2	5.991	14.029	11.057	6.517	12.934	8.175	1.464	13.076
		(0.001)	(0.004)	(0.038)	(0.002)	(0.017)	(0.481)	(0.001)
3	7.815	20.543	15.231	11.814	16.359	10.550	7.593	17.170
		(0.000)	(0.002)	(0.008)	(0.001)	(0.014)	(0.055)	(0.001)
4	9.488	29.845	24.371	18.638	24.689	19.429	15.863	24.233
		(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.003)	(0.000)

Note: LR-test, Chi-Square(r), P-values in brackets. H_0 is a zero row restriction in beta, the acceptance of which implies that the variable can be excluded from the cointegrating space.

4.8.2 Testing for stationarity of x_t

In section 4.3 we have stated that all variables are I(1), according to 'traditional' stationarity tests such as Dickey-Fuller GLS, the Kwiatkowski-Phillips-Schmidt-Shin and the Clemente-Montanes-Reyes tests. In this section we look into this issue further by using the CVAR framework, that allows testing whether each variable is stationary by itself around the mean. In the CVAR framework and for $r = 3$, the test is implemented by imposing restrictions on one cointegrating relation such that only the variable of interest and the deterministic components are included. The other two cointegrating vectors are left unrestricted. The likelihood ratio test (ChiSq(5-r)) tests the null hypothesis of stationarity. Note that the test results are sensitive to both the choice of rank, r, and the inclusion of the deterministic components. We therefore report the results for all choices of rank and with shift dummies both included in (table 4.8.2) and excluded (table 4.8.3) from the cointegrating relations.

For the cointegration rank of our choice ($r = 3$) the stationarity tests seem to suggest that non-tax revenue, loans, and possibly government spending are stationary around the mean, allowing for two mean shifts. However the stationarity hypothesis is rejected for each variable with $r = 2$. Mean-stationarity is also rejected for all variables for all choices of rank when the shift dummies are excluded.

It is important to note that the small size of our sample may play an important role here. Indeed the order of integration is a statistical approximation ($x_t \sim I(1)$) and it is often difficult to make clear-cut distinctions, particularly in a small sample (Juselius, 2006, p.18-19). The issue is further aggravated by the imposition of two mean shifts in an already small sample. Indeed when excluding the shift dummies all variables appear

non-stationary[27]. The small sample size may also imply a problem of degrees of freedom, as at this stage we are still estimating a large number of parameters (no restrictions have been applied yet). Indeed for $r = 2$, and therefore allowing for more degrees of freedom, all variables appear to be non-stationary.

Given the discussion above and the visual inspection of the data (see graphs in section 4.4), we remain inclined to treat all variables as $I(1)$. This choice is also confirmed by the 'traditional' stationarity tests reported in appendix 4.A.

Table 4.8.2: Test for stationarity: shift dummies included

r	DGF	5% C.V.	exptot	tax	nontax	grants	loans
1	4	9.488	21.021	24.328	16.523	22.114	18.204
			(0.000)	(0.000)	(0.002)	(0.000)	(0.001)
2	3	7.815	12.200	14.988	7.902	12.811	8.954
			(0.007)	(0.002)	(0.048)	(0.005)	(0.030)
3	2	5.991	4.926	7.741	0.872	5.646	1.984
			(0.085)	(0.021)	(0.647)	(0.059)	(0.371)
4	1	3.841	4.953	7.560	0.727	4.760	0.658
			(0.026)	(0.006)	(0.394)	(0.029)	(0.417)

Note: LR-test, Chi-Square(5-r), P-values in brackets. H_0 is stationarity.

Table 4.8.3: Test for stationarity: shift dummies excluded

r	DGF	5% C.V.	exptot	tax	nontax	grants	loans
1	6	12.592	32.274	32.239	32.214	32.951	29.707
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
2	5	11.070	23.096	22.889	23.099	23.642	20.372
			(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
3	4	9.488	15.811	15.685	16.145	16.498	13.153
			(0.003)	(0.003)	(0.003)	(0.002)	(0.011)
4	3	7.815	9.565	9.481	10.492	10.350	7.037
			(0.023)	(0.024)	(0.015)	(0.016)	(0.071)

Note: LR-test, Chi-Square(5-r), P-values in brackets. H_0 is stationarity.

4.8.3 Testing restrictions on β

In this section we test different restrictions on the beta vectors to obtain indications on the stationarity of possible combinations of variables and therefore their possible inclusion in

[27]It is also possible that the two shifts in the mean in such a small sample account for the otherwise accepted trend-unit-root behaviour.

the long run system as equilibrium relations. Essentially this procedure is an exploration of cointegration properties of the variables (Juselius, 2006, p.191). If a relation is not found to be stationary at this point, it may not be sensible for it to enter the LR structure.

More formally the test procedure involves imposing zero restrictions on some variables in a given beta vector, allowing the remaining parameters to be estimated and keeping the other two cointegrating relationships unrestricted. The null hypothesis is then the stationarity of a particular relation which, if accepted, suggests that the tested relation is a possible candidate for inclusion amongst the three cointegrating relations in the final LR structure. Note that the results at this point are not final, since the coefficients are estimated in a system that is not fully specified. We will therefore not discuss them at length, although we can still judge whether they are plausible and consistent with expectations. For each tested relation we impose one normalization[28] and two restrictions at least, which is what will be needed for LR identification. However when only two restrictions are imposed (in addition to one normalization) the relation is just-identified and therefore the p-value is 1 by construction, i.e. restrictions are not testable (Juselius, 2006, p.189).

Table 4.8.4 tests a number of possible relations and the last column reports the p-value for the null of stationarity. The goal is not only to find stationarity but also to assess the reducibility of relations, i.e. if it is possible to drop one additional variable from the relation while preserving stationarity. By testing different specifications of the possible cointegrating relations we can also assess their stability in terms of the sign and magnitude of coefficients.

The table is organized around the expected relations formulated in sections 4.1 and 4.7.3 and namely: budget equilibrium, aid and expenditure, and aid and tax. As far as the budget equilibrium is concerned, $H1$ includes all the variables that can be expected to be part of that equilibrium. The relation is just identified as only two zero restrictions on the shift dummies are included. Relations $H2$ to $H6$ impose further restrictions on this relation and indeed it is possible to reduce the budget equilibrium relation until $H7$. This relation is stationary with a p-value 0.692 and it only includes the domestic budget variables, namely public expenditure, tax and non-tax revenue. It suggests that both revenue variables are positively related with expenditure, as expected. Regime dummies

[28]Note that normalisation is not counted as a restriction and can be done on different variables in the relation without changing the ratio between the coefficients, as long a s one normalises on statistically significant coefficient.

Table 4.8.4: Hypothesis testing on β

HP	exptot	tax	nontax	grants	loans	1991	1974	p-value
Budget equilibrium								
H1	1	-0.703	-0.275	-0.013	-0.051	0	0	1
H2	1	-0.696	-0.338	0.001	0	0	0	0.391
H3	1	-0.719	-0.281	0	-0.045	0	0	0.765
H4	1	-0.731	-0.189	0	0	-0.177	-0.156	1
H5	1	-0.694	-0.330	0	0	-0.021	0	0.426
H6	1	-0.689	-0.347	0	0	0	0.016	0.409
H7	**1**	**-0.695**	**-0.338**	**0**	**0**	**0**	**0**	**0.692**
Irreducibility of the budget equilibrium relation								
H8	1	-10.875	0	0	0	0	0	0.001
H9	1	-0.785	0	0	0	-0.385	-0.361	0.630
H10	1	0	-0.738	0	0	0	0	0.003
H11	1	0	-2.958	0	0	2.933	2.881	0.461
Aid and expenditure								
H12	**1**	**0**	**0**	**-0.761**	**-0.452**	**0.784**	**-0.145**	**1**
H13	**1**	**0**	**0**	**-0.807**	**-0.558**	**0.993**	**0**	**0.8693**
H14	1	0	0	-0.607	-0.012	0	-0.715	0.0203
H15	1	0	0	-0.325	-0.873	0	0	0.0030
H16	1	0	0	-0.494	0	-0.258	-0.744	0.0575
H17	1	0	0	0	1.342	-2.794	-2.491	0.3849
Aid and taxation								
H18	**0**	**1**	**0**	**-0.910**	**-0.712**	**1.709**	**0.449**	**1**
H19	**0**	**1**	**0**	**-0.884**	**-0.393**	**1.135**	**0**	**0.628**
H20	0	1	0	-0.686	0.308	0	-0.856	0.017
H21	0	1	0	-4.428	10.636	0	0	0.002
H22	0	1	0	-0.559	0	0	0	0.002
H23	0	1	0	0	-2.101	0	0	0.005

Note: the p-values refer to the stationarity test on the residuals of the corresponding relations, thus indicating whether the relations are stationary and therefore valid as long run relations. H_0 is stationarity. Rows in bold indicate possible valid specifications for the long run relations.

can be excluded from this relation, indicating that the domestic budget equilibrium exists regardless of the regime changes. This is consistent with the thesis of continuity across periods mentioned in section 4.4 (see also chapter 2). By testing relations $H8$ to $H11$ we show that $H7$ is irreducible since by imposing a further zero restriction on tax or non-tax revenue, stationarity is rejected (unless regime dummies are brought back in the relation).

When examining the relation between aid and expenditure, the domestic revenue variables are restricted to zero and the expected positive relation is confirmed. $H12$ is just identified, while $H13$ to $H15$ test zero (over-identifying) restrictions on the dummy vari-

ables. The results show that the 1991 dummy is necessary to achieve stationarity, while the 1974 one may be excludable. The relation is not stationary when loans are excluded while grants could be restricted to zero ($H16$ and $H17$).

Finally the relation between tax and aid variables is explored in $H18$ to $H23$. Different possibilities for further reducing the just-identified relation $H18$ of tax, grants and loans, including both dummies, are explored. However only the 1974 dummy could be restricted to zero without rejecting stationarity. Both the just-identified $H18$ and the over-identified $H19$ suggest a positive relation between tax and both aid variables.

In terms of the possible LR structure, the testing on β suggests that the three long run relations hypothesised in sections 4.1 and 4.7.3 are empirically valid, besides being economically sensible. In particular the testing procedure allows us to identify possible valid specifications for these three relations that are highlighted in bold in table 4.8.4. It also allows us to assess possible over-identifying restrictions. In particular the following three cointegrating relations are valid candidates for the LR structure:

- The first CI relation, later Beta(1), is the domestic budget equilibrium. This relationship is very stationary in all possible specifications, also when including shift dummies and the aid variables. However the testing procedure shows that aid variables do not need to be included and that therefore there exists an irreducible domestic fiscal equilibrium. This means that the government budget is in equilibrium with domestic revenue alone. This is an equilibrium that is valid over the whole sample, as mean shifts can be excluded. The coefficients are rather stable in different specifications.

- The second possible CI relation, later Beta(2), summarizes the relationship between total expenditure and the aid variables. This relationship needs the 1991 dummy to be stationary and therefore the exclusion of the 1974 dummy may be considered as an over-identifying restriction. Although statistical testing would allow considering a further restriction on grants, the economic interpretability of results would benefit by its inclusion given that aid is the main variable of interest here.

- The third relation, later Beta(3), shows a positive association between tax revenue and the aid variables in the long run. As for the previous relation, the 1991 dummy is needed to achieve stationarity and therefore the only other restriction that may be considered is on the 1974 shift.

Note that all these relations are stable as the coefficients are consistent in the different

specifications where stationarity is accepted.

Interestingly when aid is included in the LR relations, and namely in the relations with expenditure and tax, at least the 1991 shift dummy is needed to achieve stationarity. First of all, this confirms our choice to keep it in the system despite the borderline result for its excludability in section 4.8.1. Secondly, this result is largely in line with the Ethiopian historical context. While we have argued that the administrative apparatus showed some signs of continuity between regimes, and indeed the domestic budget equilibrium does not require dummies to achieve stationarity, aid has changed more decidedly across regimes. Particularly in 1991 foreign presence switched from the socialist influence of the Soviet block to the liberal prescriptions of Western donors and institutions. The inclusion of the 1991 dummy therefore fits the historical events very well. While the 1974 regime shift also had implications in terms of aid (see chapter 2), they were surely less dramatic than in 1991. Moreover there are only a few observations before 1974, therefore contributing to making this dummy excludable from the second and third relations.

4.8.4 Test for a zero restriction in α: weak exogeneity

We now move on to testing restrictions on α, and particularly long run weak exogeneity. The testing procedure here is focused on a model that is not yet identified. Therefore the goal is more to identify the possibility of adopting a partial model, treating one or more variables as exogenous, rather than to assess exogeneity *per se*. For the latter aim in particular the test is repeated for the identified model presented in section 4.9.

In the CVAR context, a variable is said to be weakly exogenous in the long run parameters if it is not adjusting to the LR equilibrium error given by the cointegration relations. This can be tested as zero row restriction in alpha for an individual variable, and therefore the null hypothesis is no adjustment or weak exogeneity. A zero row in alpha, if accepted, defines a common driving trend as the cumulated sum of the empirical shocks to the exogenous variable[29]. An exogenous variable therefore can be seen as having influenced the long-run stochastic path of the other variables without itself having been influenced by them. Note that to be compatible with $r = 3$, there can be at most 2 $(= p - r)$ zero rows in alpha (Juselius, 2006, p.194).

Table 4.8.5 shows that for our choice of $r = 3$, tax revenue is signalling some potential

[29]For a more detailed discussion on common driving trends and the MA representation, see appendix 4.B.

long-run weak exogeneity[30]. While weak exogeneity of tax is possible, this result may simply indicate slow adjustment. Loans also exhibit some signs of long-run weak exogeneity although the null can only be accepted with a rather small p-value of 0.073. For neither of the two potentially exogenous variables identified could the null of weak exogeneity be accepted with confidence, since the p-values are never larger than 0.1. Given the weak evidence for exogeneity, we therefore do not proceed with partial models. However weak exogeneity is re-assessed in our identified LR structure to identify possible common driving trends (for a detailed discussion on common driving trends see appendix 4.B).

Table 4.8.5: Test of weak exogeneity

r	DGF	5% C.V.	exptot	tax	nontax	grants	loans
1	1	3.841	1.189	0.919	7.240	3.745	1.732
			(0.276)	(0.338)	(0.007)	(0.053)	(0.188)
2	2	5.991	5.434	1.115	8.179	6.970	3.732
			(0.066)	(0.573)	(0.017)	(0.031)	(0.155)
3	3	7.815	11.981	6.340	14.330	9.868	6.968
			(0.007)	(0.096)	(0.002)	(0.020)	(0.073)
4	4	9.488	21.232	11.385	18.414	16.179	16.413
			(0.000)	(0.023)	(0.001)	(0.003)	(0.003)

Note: LR-Test, Chi-Square(r), P-values in brackets. H_0 is a zero row restriction in alpha and therfore weak exogeneity.

4.8.5 Test for unit vectors in α

In the previous section we have tested a zero row restriction in α, indicating no adjustment and therefore weak exogeneity. Here instead we test for a unit vector in alpha, which is a mirror image of the test of the weak exogeneity. It considers whether a variable is purely adjusting to the long-run equilibrium error. If this is the case, the shocks to this variable only have transitory but no permanent effects on any of the variables in the system, therefore without any contribution to common driving trends (Juselius, 2006, p.200-201).

The results reported in table 4.8.6 suggest that government spending may be accepted as purely adjusting to CI relations, and this would be supported for both neighbouring choices of rank (2 or 4). These results offer some insight on the behaviour of variables and they may also be indicative in the choice of normalization.

Note that while the previous results on weak exogeneity do not allow for clear cut

[30]The null would be more strongly accepted for r=2 but rejected for r=4.

answers, table 4.8.6 suggests that none of the revenue variables can be considered endogenous with a sufficient degree of confidence. While we cannot accept that tax is weakly exogenous, as shown in the previous section, the unit test on alpha allow us to reject that it is endogenous. Importantly, the same is the case of grants: although we do not have clear evidence for its exogeneity, the result in table 4.8.6 allow us to reject that it is endogenous. In fact it is the least significant variable in the test for a unit vector in alpha with $r = 3$.

Table 4.8.6: Test of unit vector in alpha

r	DGF	5% C.V.	exptot	tax	nontax	grants	loans
1	4	9.488	10.299	18.369	15.977	18.379	19.063
			(0.036)	(0.001)	(0.003)	(0.001)	(0.001)
2	3	7.815	3.300	10.023	9.809	13.941	12.869
			(0.348)	(0.018)	(0.020)	(0.003)	0.005)
3	2	5.991	3.278	5.605	6.431	9.990	5.830
			(0.194)	(0.061)	(0.040)	(0.007)	(0.054)
4	1	3.841	2.749	4.837	6.415	3.468	0.561
			(0.097)	(0.028)	(0.011)	(0.063)	(0.454)

Note: LR-test, Chi-Square(5-r), P-values in brackets. H_0 is a unit vector in alpha, and therefore that the variable is purely adjusting.

4.9 CVAR: long run structure and results

The previous section has offered useful indications on what the cointegrating relations may be, including the possible just-identifying and over-identifying restrictions. In particular we have identified three possible equilibrium relations: a domestic budget equilibrium, a relation between aid and expenditure, and a relation between aid and tax revenue. In addition section 4.8.4 led us to discard the possibility of estimating a partial model because of only weak indications on exogeneity. So far we have looked only at single relations, whereas the LR structure is a system of three cointegrating equations. Therefore after having defined the final LR structure, we consider again system-stationarity as well as exogeneity.

At this stage it is worth making a distinction between a just-identified structure with two $(= r-1)$ restrictions and one normalization for each CI relation, and an over-identified structure with more than two restrictions for at least one CI relation and one normalization each. Starting from the just-identified system, it is possible to test the over-identifying restrictions to obtain a more parsimonious structure. Note that while the testing on beta

(section 4.8.3) indicated possible restrictions, these need to be tested in the context of a system of 3 CI relations. As suggested by Juselius (2006, p.189), "if a relationship is stationary it does not generally make sense to add more variables". This, together with the possibility of releasing additional degrees of freedom, makes the adoption of over-identifying restrictions preferable.

4.9.1 Results

Tables 4.9.1 and 4.9.2 report the results for the over-identified system, whereas the ones for the just-identified model are reported in appendix 4.F. The three cointegrating relations included are:

- Beta(1): domestic budget equilibrium, corresponding to H7 in table 4.8.4;
- Beta(2): the aid-expenditure relation, corresponding to H12;
- Beta(3): the aid-tax relation, corresponding to H19.

The stationarity of this system is accepted with p-value 0.849 ($ChiSqr(3) = 0.803$) and normality is also accepted with a p-value of 0.068 ($ChiSqr(10) = 17.323$), thus ensuring valid inference. We imposed three over-identifying restrictions: both regime dummies in Beta(1) and the 1974 dummy in Beta(3)[31].

Table 4.9.1 shows the beta vectors before normalization and the the matrix of beta coefficients for the three CI relations, while table 4.9.2 reports the matrix of alpha coefficients. Beta coefficients define the LR equilibrium relations between the variables included. Normalization of the β vectors is always done on a significant variable[32]. In addition to this statistical criterion, normalization is also decided to ease economic interpretability[33]. Note however that the results of the normalized beta should still be read as a vector and not as causal effects, since pushing and pulling forces still have to be determined.

The α coefficients capture adjustment behavior. In particular the adjusting variables are those with a higher (significant) t-ratio in the α matrix. The sign of the alpha coefficient should be the opposite of the corresponding beta to ensure equilibrium correction. In

[31] Results of a system with just two over-identifying restrictions, namely the two dummies in beta 1, are largely consistent with the ones presented here.

[32] Note also that the test of a unit vector in α showed some support for expenditure to be adjusting, thus supporting the decision to normalize on it in Beta(1) and Beta(2). As for Beta(3), the testing on alpha in section 4.8.5 suggests, though weakly, that tax is the most adjusting between the three variables included.

[33] Contrary to a regression model, a change in the normalization will not change the ratio between the coefficients (Juselius, 2006, p.120).

our system this is the case for all significant alpha, therefore signalling no over-shooting behavior.

The results in Beta(1) confirm the domestic budget equilibrium where tax and non-tax revenue are both positively associated with total expenditure, the former more strongly than the latter both in terms of significance and magnitude. The most adjusting variable in this relation is expenditure, followed by tax.

Beta(2) shows a relation between expenditure and aid variables, where grants are more strongly related to expenditure than loans. Both shift dummies are included and significant, indicating a positive shift of the mean in 1974 and a negative one in 1991. The most adjusting variable is non-tax revenue, followed by grants and, though less strongly, loans.

Beta(3) shows that tax revenue is positively associated with both aid variables, and more so with grants than loans both in terms of significance and magnitude. When the tax relation is out of equilibrium, it is mainly non-tax revenue to adjust, followed by total expenditure[34]. The 1991 shift is significant and it implies a negative mean shift in the tax relation following the fall of the Derg regime.

In terms of weak exogeneity, the previous results (section 4.8.4) are largely confirmed. In particular it is possible to accept weak exogeneity of loans with a p-value of 0.131 (ChiSqr(6) = 9.843)[35].

4.9.2 Interpretation

Generally all relations identified here are economically sensible and they correspond to our expectations. The domestic budget equilibrium is confirmed as a stationary relation, excluding aid and both regime dummies. This implies that such an 'internal' relation exists in Ethiopia regardless of the regime. The 'internal' budget equilibrium is consistent with the elements of continuity that caracterized in the political and administrative environment in Ethiopia throughout the period (see chapter 2). Moreover aid does not appear to be necessarily part of the long run budget equilibrium. This is consistent with the general feeling amongst Ethiopian policy makers that aid is not a reliable source of revenue and it is preferable to rely on domestic revenues instead (for a more detailed discussion on this

[34] Tax, grants and loans signal some overshooting behaviour in the third relation, as the corresponding α and β have the same sign. However the α are not significant for any of the variables and the combined coefficients of the overshooting variables are still lower than the significant adjusting ones, thus compensating the overshooting (though non-significant) behaviour and ensuring the stability of the system.

[35] Results available from the authors.

Table 4.9.1: LR results on beta

	exptot	tax	nontax	grants	loans	1974	1991
The beta vectors before normalization							
Beta(1)	13.277	-9.207	-4.496	0	0	0	0
Beta(2)	14.031	0	0	-10.068	-4.107	-5.034	7.403
Beta(3)	0	7.247	0	-6.558	-2.724	0	8.415
The beta vectors normalized							
Beta(1)	1	-0.693	-0.339	0	0	0	0
	-	(-11.295)	(-8.562)	-	-	-	-
Beta(2)	1	0	0	-0.718	-0.293	-0.359	0.528
	-	-	-	(-9.499)	(-5.145)	(-8.716)	(4.910)
Beta(3)	0	1	0	-0.905	-0.376	0	1.161
	-	-	-	(-5.824)	(-3.354)	-	(5.233)

Note: t-values in parenthesis.

Table 4.9.2: LR results on alpha

	Alpha(1)	Alpha(2)	Alpha(3)
exptot	-0.421	-0.220	0.240
	(-3.062)	(-1.515)	(3.195)
tax	0.390	0.065	0.084
	(2.254)	(0.353)	(0.893)
nontax	0.524	-1.886	1.047
	(1.412)	(-4.807)	(5.165)
grants	-0.448	1.718	-0.460
	(-0.869)	(3.154)	(-1.634)
loans	-1.066	1.691	-0.325
	(-1.452)	(2.180)	(-0.812)

Note: t-values in parenthesis.

see chapter 2). The two main policy instruments are expenditure and tax, with the former being the most adjusting variable. This suggests that tax revenue drives spending, as also found in the case of Uganda (Bwire, 2013).

As far as aid is concerned, the results show a positive fiscal effect of aid since it is positively associated with both expenditure and tax revenue. As far as the latter is concerned, we find no evidence of a disincentive, or substitution, effect between aid and tax. On the contrary both aid variables are positively associated with tax in the long run. This result may be due to the positive effects of aid on the tax administration and on improving tax policy, as well as through a possible positive effect on income. In addition the result shows that grants and loans have a similar effect, although it is stronger for

the former. The non-significant alpha coefficients on tax, grants and loans in the third CI relation do not give clear indications about the possible direction of causality.

Moreover both in Beta(2) and in Beta(3) grants seem to be more related to the fiscal variables than loans, thus suggesting a larger beneficial effect of such aid modality. It may be useful to point out that over the period the share of grants and loans on total aid has been roughly equal, with grants increasing more substantially than loans only in the last years of the sample (see figure 1).

As far as the effect of aid on expenditure is concerned, the coefficients show that, for example, a 1% increase in grants is associated with a 0.72% increase in total expenditure[36]. Given that the nominal amount of grants is substantially smaller than expenditure, these figures suggest that expenditure increased by more than the amount of grants. Importantly, this is consistent with a positive association between aid and tax. For example, at 2010 values, an increase in grants of 124 million ETB is associated with a 501 million ETB increase in total expenditure.

In addition the adjustment coefficients in the second relation, between aid and expenditure, show that both grants and loans are adjusting while expenditure is not. This may suggest that in the positive relation between aid and expenditure, causality may run from the latter to the former. Such behavior may be indicative of a donor disbursement rule whereby donors increase aid in response to commitment from the government in terms of increased expenditure (consistently with the results in Martins (2010)).

Although we cannot draw conclusions on borrowing, we can still draw some indications on its stationarity. Indeed since our system that excludes borrowing (therefore capturing it in the residuals) is stationary, it must follow that borrowing is stationary too. This means that the government does not systematically increase borrowing, which would imply a non-stationary behaviour.

4.10 Short run structure

The short run structure of a CVAR model has some important differences from the LR identification. First of all, while the CI relations in our model are $r = 3$ LR equilibrium relations between endogenous variables with the same time index, the SR equations are $p = 5$ relations between p current variables (Δx_t); $(p \times (k-1))$ lagged variables

[36] Note that the log transformation does not allow a more straightforward interpretation in terms of changes in nominal amounts.

$\Delta x_{t-i}, (i = 1, \ldots, k-1)$; and r lagged equilibrium errors $\beta(x_{t-1})$ from the identified LR structure. Identification of the short-run structure requires $(p-1)$ restrictions on each of the simultaneous equations[37].

Two other important differences exist with respect to the LR identification. First of all, the distinction between endogenous and exogenous variables may change SR identification whereas it did not change the LR structure that is rather based on vectors. Secondly, identification of the SR structure requires uncorrelated residuals, whereas no such requirement existed in the LR structure. Therefore the residual covariance matrix plays an important role in the SR structure. In particular uncorrelated residuals of a short-run structural model may be interpreted as estimated shocks, whilst large off-diagonal elements in the covariance matrix can be a signal of significant current effects between the system variables (Juselius, 2006, p.230). Indeed "the VAR model can be considered a reduced form model in the SR dynamics in the sense that potentially important current (simultaneous) effects are not explicitly modeled but are left in the residuals" (Juselius, 2006, p.230). The high correlation coefficients in the residual covariance matrix may also be due to the omission of relevant variables.

The just-identified short run structure is heavily over-parameterised. This section reports only a parsimonious system, following the SR identification strategy of parsimonious parameterisation discussed in Juselius (2006, chapter 13). In particular the estimated coefficients with small t-statistics ($p - value > 0.10$) were set to zero. Since there are some non-negligible correlation coefficients in the residual covariance matrix (see table 4.10.2), the interpretation of the short-run equations as causal relationships should be taken with caution. The results are shown in table 4.10.1 where the first column (labeled 'Y') indicates the dependent variable of the equation, the number in parentheses are t-values and CI1, CI2 and CI3 correspond respectively to Beta 1, 2 and 3[38]. The 30 over-identifying restrictions were accepted with a p-value of 0.5 (LR test of over-identifying restrictions: $Chisq(30) = 29.325$).

The government expenditure equation shows positive association with past changes of foreign grants and loans, albeit with limited magnitude. The negative coefficient on CI1 is consistent with the adjustment of government expenditure to the long-run internal budget equilibrium found in the LR structure.

[37] See Juselius (2006), chapter 13, for more details.

[38] Note that *exptot* is not reported in the columns as it does not enter any of the SR equations according to the parsimonuois parametrization strategy discussed before.

Table 4.10.1: Short run results

Y	tax	ntax	grants	loans	CI1	CI2	CI3	1991	1974
exptot	0	0	0.16	0.11	-0.58	0.25	0	0	0.16
	-	-	(4.32)	(4.49)	(-5.58)	(6.02)	-	-	(2.02)
tax	0	0.20	0.08	0	0.46	-0.17	0.17	-0.26	0
	-	(3.60)	(1.84)	-	(2.83)	(-2.51)	(3.31)	(-2.66)	-
nontax	0	0	0.24	0.16	0	0	0.19	0	0.42
	-	-	(2.43)	(2.19)	-	-	(2.12)	-	(1.69)
grants	0	0	0	0	0	0	4.46	0	0
	-	-	-	-	-	-	(3.96)	-	-
loans	-1.14	0	0.48	0	-1.74	0.74	0	0	0
	(-2.57)	-	(2.79)	-	(-3.47)	(3.70)	-	-	-

Note: t-values in parenthesis.

In the SR tax adjusts to all three CI relations and it responds positively to changes in grants, consistently with the LR results. Also non-tax revenue responds positively to both aid variables.

Grants do not seem to be adjusting to any of the other variables in the short run, except for reacting to the third cointegrating relation. This is consistent with the alpha matrix in the LR and it may suggest the exogeneity of grants in the SR.

Loans seem to follow grants, and respond to changes in the past changes in tax. The variable also seems to adjust to the first two equilibrium errors.

Table 4.10.2: Residual covariance matrix

	exptot	tax	nontax	grants	loans
texp	0.089				
tax	0.356	0.010			
ntax	0.409	-0.162	0.248		
grants	-0.039	0.104	-0.009	0.320	
loans	0.408	0.170	-0.043	0.122	0.420

4.11 An alternative model with disaggregated expenditure

Having identified the fiscal effects of aid on tax and expenditure, we now turn to exploring the latter in more detail by further disaggregating capital and recurrent expenditure. Given the weak results on the short run and the difficulty to identify common trends (for a more detailed discussion, including the MA side, see appendix 4.B), in this section we

aim at unpacking the LR effects of aid on expenditure and therefore we focus primarily on the LR structure[39].

Since an additional variable would be very demanding on the model when the sample is small, we aggregate tax and non-tax revenue into domestic revenue thus keeping $p = 5$. The aggregation of tax and non-tax revenue is also supported by the similar coefficients in the LR equations, although we have shown that their adjustment behaviour differs.

We therefore model a system of 5 variables: recurrent and capital government expenditures (*rexp* and *cexp*); domestic revenue (*domrev*); and central government aid receipts, distinguishing between grants and loans. Consistently with the discussion in section 4.6.1, we include an unrestricted constant that allows for a trend in the variables in levels but no trend in the cointegrating space. We also include the two political regime dummies discussed before.

The lag length tests are reported in appendix 4.G and they suggest lag length of 1. However given the rejection of multivariate normality at $k = 1$, we choose $k = 2$ for which the problem is less severe. In particular Juselius (2006, p.76-77) notes that VAR estimates are more sensitive to deviations from normality due to skewness than to excess kurtosis. As the deviations from skewness are less severe for the choice of lag length of $k = 2$ (see results of misspecification tests in appendix 4.H), this is our choice of lag length for this analysis[40]. To test the robustness of our results to deviations from normality we also estimate a model that excludes the regime dummies, for which normality can be achieved. These results are reported in appendix 4.K and they are largely consistent with our main results, thus confirming robustness. The other misspecification and parameter constancy tests do not signal other issues and the trace correlation for the underlying UVAR is 0.509 (for results, see appendix 4.H).

As discussed in section 4.7, we consider both formal test procedures as well as other information in the determination of the cointegration rank r[41]. For this system the tests could support both the choice of $r = 3$ and of $r = 4$. Based on the roots of the companion matrix and the inspection of the alpha matrix, we choose $r = 3$. However a system with $r = 4$ is estimated for robustness and the results are reported in appendix 4.J. Note that

[39]The estimation of the SR structure and of common trends was carried out but the properties of the system were inferior to the previous one both in terms of the SR structure (rejection of multivariate normality imposes even more caution) and of the MA representation (due to even more correlated residuals).

[40]Note that other papers in the literature proceed with CVAR estimation even without accepting normality (Martins, 2010; Bwire, 2013), on the grounds that multivariate normality may not be crucial for sound inference.

[41]Results not reported for reasons of space and clarity.

Table 4.11.1: LR results on beta with disaggregated expenditure

	cexp	rexp	domrev	grants	loans	1974	1991
			The beta vectors before normalization				
Beta(1)	9.297	1.978	-15.508	0.000	0.000	0.000	0.000
Beta(2)	7.273	0.000	0.000	-6.450	-1.295	-5.124	1.241
Beta(3)	0.000	10.457	0.000	-3.743	-2.103	-4.941	-0.480
			The beta vectors normalized				
Beta(1)	-0.599	-0.128	1.000	0.000	0.000	0.000	0.000
	(-14.093)	(-1.839)	(.NA)	(.NA)	(.NA)	(.NA)	(.NA)
Beta(2)	1.000	0.000	0.000	-0.887	-0.178	-0.705	0.171
	(.NA)	(.NA)	(.NA)	(-15.030)	(-3.097)	(-6.878)	(2.062)
Beta(3)	0.000	1.000	0.000	-0.358	-0.201	-0.472	-0.046
	(.NA)	(.NA)	(.NA)	(-7.824)	(-4.616)	(-6.132)	(-0.746)

Note: t-values in parenthesis.

with $r = 4$ it is possible to also test robustness of our main system, since all the previous CI relations can be included. The results are largely consistent with the rest of the analysis and they therefore provide support for robustness.

As before, the long run structure is identified according to the testing on alpha and beta[42] as well as economic interpretability. Tables 4.11.1 and 4.11.2 show the results for an identified LR structure with over-identifying restrictions and $r = 3$, that is accepted as stationary with a p-value of 0.564.

The first CI relation corresponds to the domestic budget equilibrium previously identified and it therefore confirms the validity of that result in a different system. The equilibrium between government spending and domestic revenue is confirmed regardless of the change in regime, since both dummies are restricted to zero. As expected, domestic revenue is positively associated with both recurrent and capital expenditure, but more strongly so with the latter. Recurrent expenditure is found to be the single most adjusting variable, in Beta(1) as well as in the other CI relations.

Beta(2) and Beta(3) roughly correspond to the second CI in the previous system, but now the aid variables are related separately to capital and recurrent expenditure respectively. To ensure consistency with our previous system, these CI relations include both regime dummies. Consistently with the previous results, the 1974 dummy has a positive effect on the relation between aid and both components of spending while the 1991 dummy

[42] Results on tests on alpha and beta not reported for reasons of space and clarity.

Table 4.11.2: LR results on alpha with disaggregated expenditure

	Alpha(1)	Alpha(2)	Alpha(3)
cexp	0.214	-0.222	-0.114
	(0.529)	(-1.168)	(-0.419)
rexp	0.842	0.329	-0.585
	(4.978)	(4.142)	(-5.126)
domrev	-0.163	0.081	-0.248
	(-0.726)	(0.770)	(-1.638)
grants	0.078	0.750	0.557
	(0.129)	(2.644)	(1.366)
loans	0.415	-0.207	0.531
	(0.439)	(-0.467)	(0.832)

Note: t-values in parenthesis.

has a negative effect when significant. Note that a further over-identifying restriction could be imposed on the non-significant 1991 dummy in Beta(3) without changing the results. Generally, the results confirm the positive relation of both loans and grants with both components of public expenditure. The disaggregation however shows that the strongest effect in terms of magnitude and significance is that of grants on capital expenditure. Grants are also more related to current expenditure but the difference with the coefficient on loans is less marked in Beta(3) than in Beta(2).

The positive and strong relation between grants and capital expenditure is consistent with other findings in the literature (Fagernas and Schurich, 2004; Fagernas and Roberts, 2004a; Martins, 2010). On the one hand this result may seem counter intuitive: indeed it may be reasonable for loans to be more related to the more 'productive' capital expenditure since they have to be repaid in the future. In practice however loans to Ethiopia are largely concessional, making repayment an issue rather distant in time that therefore might not have direct policy implications. On the other hand grants may come with more conditionality, in the form of pressure to spend on productive capital rather than recurrent ('consumption') expenditure, precisely because they do not require repayment. The idea that capital spending is preferable to recurrent expenditure may be slowly fading in the international debate. However, in a historical perspective, this distinction may be behind the result of grants being mostly associated with capital expenditure. Moreover the donor disbursement rule identified before it is confirmed here, with grants being the second most adjusting variable after *rexp*. This suggests that donors back a commitment to increased domestic capital expenditure with grants.

4.12 Conclusions

This chapter shed light on the fiscal effects of aid in Ethiopia and in particular it answered the research questions raised in section 4.1 on the hypothesized effects of aid. To do so we used a CVAR methodology that proved particularly useful to disentangle the complex dynamics that occur in the government budget process. The analysis showed that all the basic assumptions of the CVAR model are satisfied, thus making this methodology suitable for the analysis of our Ethiopian data as well as allowing valid inference.

In particular we provide evidence for the existence of a domestic budget equilibrium that includes domestic revenues and government expenditure, but excludes aid. The domestic budget equilibrium is confirmed in the two systems estimated in this chapter as well as in the alternative systems used for checking robustness. This relation holds regardless of the regime changes across the whole period considered. By looking at adjustment coefficients we also find that spending plans are mainly driven by tax revenue, while expenditure is the most adjusting variable.

Moreover we find no evidence of a negative effect of aid on tax revenue, which implies that the government of Ethiopia does not substitute taxes with aid nor is it discouraged in its tax efforts. On the contrary we find a positive and robust relation between tax revenue and both grants and loans in the LR, which is largely confirmed in the short run structure too. This relation may be explained by a beneficial effect of aid in improving tax administration and strengthening domestic institutions. Indeed throughout the whole period the government of Ethiopia has received foreign advice on tax matters and this remains today one of the policy areas of highest agreement between the government and donors. Moreover Ethiopia's history of independence from colonial powers has profoundly shaped the national character and pride, making financial independence a core priority of the current government. As a consequence, the case for a substitution or tax displacement effect of aid is particularly ill-grounded in Ethiopia as confirmed by this analysis.

In addition both aid variables are found to have a positive and robust relation with public expenditure. This relation is stronger between capital expenditure and grants in particular, as shown in the alternative system using disaggregated expenditure data. This finding is consistent with the results in the literature and with the idea that donors may have a preference for grants to be spent on the more productive capital expenditure rather than on 'consumption' recurrent expenditure. We are also able to identify a donor disbursement rule whereby donors back proven commitment to increased expenditure with additional funding, particularly grants.

As far as exogeneity is concerned, we are not able to provide clear-cut results. However we find some evidence for weak exogeneity of loans in the long run. In addition the lack of a short run effect on grants of other variables in the system may support grants exogeneity in the SR structure. These results however need to be taken with caution as the direction of causality remains difficult to establish, particularly in the LR relation between tax and aid.

All the results presented here are robust to different changes in the system, which is particularly valuable in the CVAR context where results are often very model-specific. We are able to test and confirm all the underlying statistical assumptions of the VAR model, more so in our main system than in the alternative one, thus supporting the validity of our results. Moreover by using exclusively national data sources we can avoid problems related to the different international measures of aid and capture exactly the component that is most relevant for the analysis of its fiscal effects. Our dataset also presents an advantage in terms of the length of the time series available, which is the longest in the CVAR fiscal literature[43]. Last but not least, the findings of this chapter are largely rooted and consistent with the Ethiopian context and with the qualitative evidence on the political economy of the country.

In conclusion, our analysis of the fiscal effects of aid in Ethiopia does not provide any evidence of adverse effects. On the contrary aid in Ethiopia had beneficial effects both in terms of domestic revenue and government expenditure, and it has not impaired the existence of a domestic budget equilibrium.

[43]This is true for studies using annual data, while by using quarterly data it is possible to increase the number of observations even further.

Appendices

4.A Stationarity tests

Table 4.A.1: Results of Dickey-Fuller GLS test for stationarity: logs

variable	1 lag	2 lag	3 lag	4 lag	5 lag
exptot	-2.05	-2.02	-2.16	-1.72	-2.26
capexp	-2.33	-2.20	-2.18	-2.33	-1.96
recexp	-2.79	-2.69	-2.91	-2.39	-3.24
tax	-1.02	-1.28	-1.13	-1.00	-0.89
nontax	-2.55	-2.65	-3.33	-2.87	-2.41
domrev	-2.02	-2.74	-1.67	-1.62	-1.97
grants	-2.56	-1.82	-1.84	-2.07	-1.83
loans	-3.91	-2.96	-3.65	-3.04	-2.56

Note: H_0: non-stationarity. Critical values (5%): -3.223 (1 lag), -3.176 (2 lag), -3.120 (3 lag), -3.059 (4 lag), -2.993 (5 lag).

Table 4.A.2: Results of Dickey-Fuller GLS test for stationarity: logs 1st diff

variable	1 lag	2 lag	3 lag	4 lag	5 lag
exptot	-3.36	-2.47	-2.39	-1.60	-1.38
capexp	-2.51	-1.65	-1.12	-0.96	-0.54
recexp	-2.62	-1.93	-1.83	-1.29	-1.38
tax	-1.38	-1.07	-0.80	-0.55	-0.04
nontax	-3.34	-1.94	-1.92	-1.89	-1.45
domrev	-1.35	-1.87	-1.30	-0.56	-0.49
grants	-2.63	-1.51	-1.18	-1.14	-0.90
loans	-2.96	-1.53	-1.44	-1.18	-0.98

Note: H_0: non-stationarity. Critical values (5%): -2.306 (1 lag), -2.277 (2 lag), -2.245 (3 lag), -2.211 (4 lag), -2.178 (5 lag).

Table 4.A.3: Results of Kwiatkowski-Phillips-Schmidt-Shin test for stationarity: logs

variable	0 lag	1 lag	2 lag	3 lag	4 lag	5 lag
exptot	0.25	0.15	0.11	0.10	0.09	0.08
capexp	0.23	0.15	0.11	0.10	0.09	0.09
recexp	0.17	0.10	0.08	0.07	0.06	0.06
tax	0.44	0.25	0.19	0.16	0.14	0.13
nontax	0.30	0.18	0.13	0.12	0.11	0.10
domrev	0.25	0.15	0.11	0.10	0.09	0.09
grants	0.44	0.29	0.23	0.19	0.17	0.16
loans	0.26	0.18	0.16	0.15	0.14	0.15

H_0: series is trend stationary

Critical values: 10%: 0.119, 5% : 0.146, 1% : 0.216.

Table 4.A.4: Results of Kwiatkowski-Phillips-Schmidt-Shin test for stationarity: logs 1st diff

variable	0 lag	1 lag	2 lag	3 lag	4 lag	5 lag
exptot	0.13	0.13	0.13	0.13	0.14	0.15
capexp	0.09	0.11	0.12	0.14	0.14	0.16
recexp	0.06	0.05	0.06	0.06	0.06	0.07
tax	0.62	0.49	0.42	0.40	0.39	0.40
nontax	0.04	0.04	0.04	0.04	0.05	0.06
domrev	0.40	0.30	0.25	0.25	0.26	0.27
grants	0.04	0.06	0.09	0.10	0.09	0.12
loans	0.02	0.03	0.04	0.05	0.06	0.07

H_0: series is trend stationary

Critical values: 10%: 0.347, 5% : 0.463, 1% : 0.739.

Table 4.A.5: Results of Clemente, Montanes, Reyes unit root test with two structural breaks: logs

variable	break 1	break 2	test stat
exptot	1972	1991	-2.15
	0.06	0.01	.
capexp	1991	2002	-1.66
	0.08	0.04	.
recexp	1972	1991	-2.81
	0.02	0.00	.
tax	1974	1990	-0.69
	0.18	0.01	.
nontax	1972	1990	-2.99
	0.01	0.01	.
domrev	1972	1990	-1.68
	0.04	0.00	.
grants	1976	2001	-2.43
	0.00	0.00	.
loans	1976	1990	-2.98
	0.01	0.01	.

Note: H_0 is the presence of unit root, i.e. non stationarity; Critical value for last column statistic: -5.49 (5%); P-values for statistical significance of the break are reported under the estimated break year.

Table 4.A.6: Results of Clemente, Montanes, Reyes unit root test with two structural breaks: logs 1st diff

variable	break 1	break 2	test stat
exptot	1981	1990	-8.30
	0.97	0.00	.
capexp	1981	1990	-10.95
	0.99	0.00	.
recexp	1990	1998	-6.85
	0.06	0.92	.
tax	1987	1990	-7.56
	0.99	0.00	.
nontax	1987	1993	-8.22
	0.99	0.03	.
domrev	1987	1990	-6.04
	1.00	0.00	.
grants	1977	2000	-9.46
	0.01	0.04	.
loans	1990	2002	-6.26
	0.32	1.00	.

Note: H_0 is the presence of unit root, i.e. non stationarity; Critical value for last column statistic: -5.49 (5%); P-values for statistical significance of the break are reported under the estimated break year.

4.B The MA representation

The MA representation describes the non-stationary movement of the variables according to the common driving trends that represent the cumulated sum of the shocks to the system. If all variables in the system are stationary, either because they are $I(0)$ or because the reduced rank condition holds, the VAR can be inverted so that x_t, $t = 1, , T$, is a function of past and present shocks, ϵ_{t-j}, $j = 0, 1, , k$ initial values X_0, and the deterministic components, D_t. In particular the resulting alpha orthogonal coefficients represent the common trends, or cumulated shocks, that drive the process, while the corresponding beta orthogonal coefficients represent how these shocks load into the variables in the system. "The autoregressive formulation is useful for expressing hypotheses on economic behavior, whereas the moving average representation is useful when examining the properties of the process" (Juselius, 2006, p.48). In particular, the MA representation allows us to identify the common trends that drive the process.

The MA representation is another way to look at the LR dynamics and it is based on the chosen LR structure. The identification of common trends is highly reliant on the existence of weakly exogenous variables in the LR system. Given that we did not find enough evidence to impose weak exogeneity conditions, nor did we have strong indications that government spending is purely adjusting, the results in this section are to be taken with caution.

Similar to the identification of the long-run relations, one normalisation and $(p-r-1)$ restrictions for each of the $(p-r=2)$ common trends are required. These just-identifying restrictions would not change the likelihood function and therefore are untestable, but allow us to get the t-statistics for the estimated parameters. The moving average representation of our model with five endogenous variables and rank choice of $r = 3$ corresponds to $p-r = 2$ stochastic trends driving the system. The identification of the MA side follows the previously found signals that tax and loans may be considered more weakly exogenous than other variables, although this result was weak. In addition the inspection of unrestricted alpha orthogonal coefficients also supports the normalization of the first common stochastic trend (CT) on tax, and of the second one on loans.

These two possible CT are estimated and table 4.B.1 shows the non-normalized alpha orthogonal vectors and the normalized CT. Table 4.B.2 shows the loading of the CT on the variables in the system. In particular the shocks on loans seem to mainly affect, or load into, aid variables, while the first CT affects mainly the domestic fiscal variables.

In addition through the C matrix (table 4.B.3), it is possible to infer the overall effects

of the common trends on the SR system, although caution needs to be invoked again since the residuals in the system are highly correlated. Each column of the C matrix indicates how the cumulated residuals from each VAR equation load into each of the other variables. A significant coefficient would indicate that shocks to the corresponding variables have permanent effects on the system; an insignificant coefficient would imply a transitory effect.

So for example the column-wise inspection indicates that the most significant results are on loans, which we briefly discuss in what follows. In particular cumulated unanticipated and random shocks to loans seem to negatively and permanently affect aid grants. Similarly shocks to aid grants seem to have a negative permanent effect on loans. This may signal some substitution behavior between these two aid modalities. Shocks to loans also positively affect loans itself, indicating that such shocks (perhaps due to a famine or war) may foster higher aid-loan dependency. This may be credible since loans in theory need to be serviced although in highly concessional terms.

The rows of C matrix may indicate how each variable in the system has been affected by the cumulated empirical shocks (Juselius, 2006, p.259). For example, government expenditure seems to have been positively associated with (positive) cumulated shocks to tax, but negatively so to shocks to non-tax revenue and grants. However again it is important to keep in mind that we cannot really establish causality due to the weak results on exogeneity.

Table 4.B.1: The MA representation and decomposition of the trends

	exptot	tax	nontax	grants	loans
Alpha orthogonal before normalization					
CT(1)	-0.569	-0.694	0.320	0.304	0.000
CT(2)	0.550	-0.196	-0.018	0.598	-0.549
Alpha orthogonal normalized					
CT(1)	0.819	1.000	-0.461	-0.438	0.000
	(1.164)	(.NA)	(-1.553)	(-1.909)	(.NA)
CT(2)	-1.294	0.000	0.197	-0.934	1.000
	(-0.834)	(.NA)	(0.301)	(-1.845)	(.NA)

Note: t-values in parenthesis.

Table 4.B.2: Beta orthogonal: the loadings of the common trends

	CT1	CT2
exptot	0.541	-0.034
	(2.846)	(-1.096)
tax	0.685	-0.039
	(2.838)	(-0.983)
nontax	0.196	-0.021
	(2.891)	(-1.915)
grants	0.620	-0.298
	(2.299)	(-6.761)
loans	0.329	0.615
	(0.602)	(6.878)

Note: t-values in parenthesis.

Table 4.B.3: The long run impact matrix C

	exptot	tax	nontax	grants	loans
exptot	0.487	0.541	-0.256	-0.205	-0.034
	(1.850)	(2.846)	(-2.002)	(-2.202)	(-1.096)
tax	0.611	0.685	-0.323	-0.264	-0.039
	(1.828)	(2.838)	(-1.990)	(-2.230)	(-0.983)
nontax	0.188	0.196	-0.094	-0.066	-0.021
	(2.002)	(2.891)	(-2.072)	(-1.987)	(-1.915)
grants	0.894	0.620	-0.344	0.007	-0.298
	(2.392)	(2.299)	(-1.898)	(0.052)	(-6.761)
loans	-0.526	0.329	-0.030	-0.719	0.615
	(-0.695)	(0.602)	(-0.083)	(-2.681)	(6.878)

Note: t-values in parenthesis.

4.C Misspecification tests for UVAR $k = 1$

Table 4.C.1: Autocorrelation test

Test	test statistic	p-value
LM(1)	ChiSqr(25) = 32.662	0.140
LM(2)	ChiSqr(25) = 31.307	0.179
LM(3)	ChiSqr(25) = 24.642	0.483
LM(4)	ChiSqr(25) = 29.883	0.229

Note: Variables are measured in logs of deflated values. The null of no autocorrelation cannot be rejected for all four lags.

Table 4.C.2: Multivariate heteroskedasticity and normality tests

Test	test statistic	p-value
	Test for ARCH	
LM(1)	ChiSqr(225) = 262.498	0.044
LM(2)	ChiSqr(450) = 505.577	0.036
LM(3)	ChiSqr(675) = 690.000	0.336
LM(4)	ChiSqr(900) = 714.603	1.000
	Test for Normality	
	ChiSqr(10) = 19.375	0.036

Note: Variables are measured in logs of deflated values. The null of homoskedastic errors is rejected at the first two lags. Normality is rejected when only one lag is used.

Table 4.C.3: Univariate heteroskedasticity and normality tests

Variable	Skewness	Kurtosis	ARCH(1)	Normality	R^2
exptot	0.490	4.114	0.208 (0.648)	5.203 (0.074)	0.563
tax	-0.089	4.169	0.011 (0.916)	6.622 (0.036)	0.405
nontax	-0.114	2.391	0.515 (0.473)	0.389 (0.823)	0.432
grants	-0.195	2.881	0.155 (0.694)	0.533 (0.766)	0.539
loans	0.292	2.616	0.359 (0.549)	0.904 (0.636)	0.409

Note: P-values in parenthesis when relevant. Variables are measured in logs of deflated values.

4.D Results from UVAR $k = 2$

Table 4.D.1: Alpha coefficients from UVAR

Variable	Alpha(1)	Alpha(2)	Alpha(3)	Alpha(4)	Alpha(5)
exptot	-0.023	-0.044	-0.033	-0.000	-0.004
	(-2.267)	(-4.303)	(-3.197)	(-0.014)	(-0.356)
tax	0.018	0.010	-0.046	0.016	-0.016
	(1.427)	(0.764)	(-3.564)	(1.276)	(-1.235)
nontax	-0.119	0.024	-0.077	0.015	0.033
	(-4.340)	(0.877)	(-2.812)	(0.536)	(1.185)
grants	0.122	-0.090	-0.073	0.075	0.039
	(3.282)	(-2.416)	(-1.966)	(2.004)	(1.060)
loans	0.114	-0.123	-0.144	-0.131	0.017
	(2.257)	(-2.430)	(-2.851)	(-2.597)	(0.327)

Note: t-values in parenthesis.

Table 4.D.2: Beta coefficients from UVAR

	exptot	tax	nontax	grants	loans	1991	1974
Beta(1)	14.465	-7.072	-0.404	-3.874	-1.650	-0.124	-4.601
Beta(2)	8.717	-8.519	-4.150	2.553	0.633	-1.438	1.858
Beta(3)	-2.545	0.733	1.434	0.973	1.143	-2.914	-1.702
Beta(4)	-0.769	4.787	-1.412	-2.337	1.691	0.801	-2.027
Beta(5)	2.256	1.985	-1.981	-1.542	-0.203	-1.098	0.711

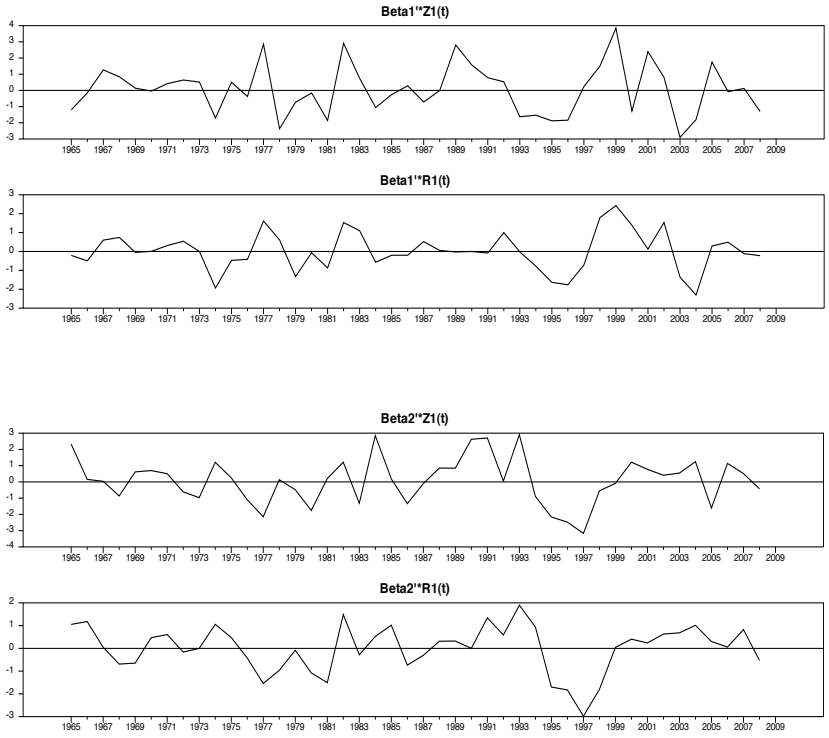
Table 4.D.3: Π matrix from UVAR

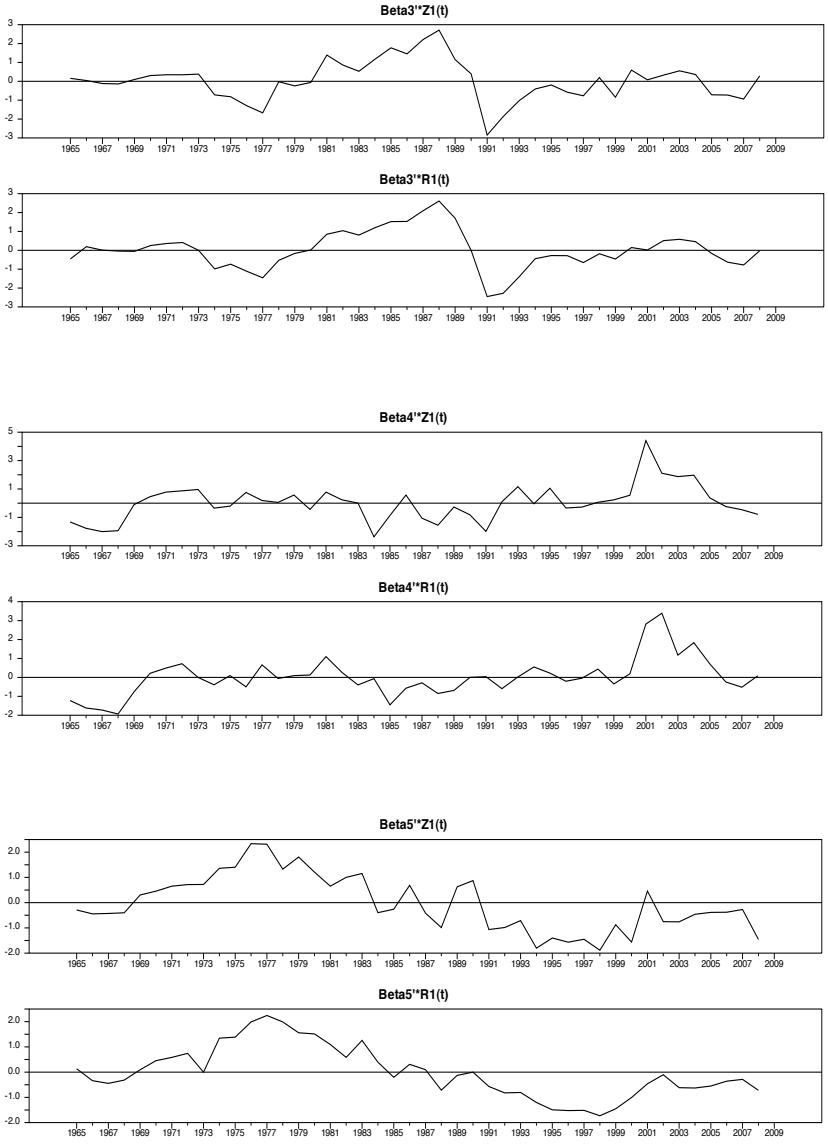
	exptot	tax	nontax	grants	loans	1991	1974
exptot	-0.650	0.512	0.154	-0.049	-0.027	0.167	0.079
	(-3.651)	(4.048)	(2.962)	(-0.859)	(-0.956)	(4.586)	(1.350)
tax	0.418	-0.199	-0.105	-0.104	-0.045	0.147	-0.033
	(1.890)	(-1.270)	(-1.631)	(-1.475)	(-1.307)	(3.260)	(-0.449)
nontax	-1.258	0.718	-0.248	0.364	0.142	0.182	0.719
	(-2.651)	(2.129)	(-1.792)	(2.405)	(1.909)	(1.873)	(4.612)
grants	1.202	0.284	0.036	-1.010	-0.224	0.344	-0.729
	(1.871)	(0.623)	(0.190)	(-4.924)	(-2.223)	(2.621)	(-3.449)
loans	1.084	-0.461	0.410	-0.614	-0.656	0.459	-0.230
	(1.244)	(-0.745)	(1.610)	(-2.207)	(-4.794)	(2.576)	(-0.803)

Note: t-values in parenthesis.

4.E Graphs of unrestricted beta relations

Figure 4.E.1: Graphs of unrestricted beta relations




Beta3''Z1(t)
Beta3''R1(t)
Beta4''Z1(t)
Beta4''R1(t)
Beta5''Z1(t)
Beta5''R1(t)

4.F LR results with just identifying restrictions

Table 4.F.1: LR results on beta with just identifying restrictions

	exptot	tax	nontax	grants	loans	1974	1991
The beta vectors before normalization							
Beta(1)	52.359	-38.258	-9.918	0.000	0.000	-8.176	-9.283
Beta(2)	163.433	0.000	0.000	-124.391	-73.864	-23.766	128.215
Beta(3)	0.000	10.466	0.000	-10.463	-7.447	4.696	17.881
The beta vectors normalized							
Beta(1)	1.000	-0.731	-0.189	0.000	0.000	-0.156	-0.177
	(.NA)	(-18.193)	(-7.015)	(.NA)	(.NA)	(-3.211)	(-5.037)
Beta(2)	1.000	0.000	0.000	-0.761	-0.452	-0.145	0.785
	(.NA)	(.NA)	(.NA)	(-7.386)	(-4.704)	(-0.771)	(4.927)
Beta(3)	0.000	1.000	0.000	-1.000	-0.712	0.449	1.709
	(.NA)	(.NA)	(.NA)	(-4.833)	(-3.877)	(1.169)	(5.137)

Note: t-values in parenthesis.

Table 4.F.2: LR results on alpha with just identifying restrictions

	Alpha(1)	Alpha(2)	Alpha(3)
exptot	-0.773	0.132	-0.045
	(-3.214)	(0.679)	(-0.419)
tax	0.599	-0.133	0.192
	(1.942)	(-0.536)	(1.381)
nontax	0.860	-2.180	1.211
	(1.318)	(-4.150)	(4.127)
grants	-1.158	2.328	-0.997
	(-1.264)	(3.158)	(-2.423)
loans	-1.357	2.302	-0.857
	(-1.075)	(2.264)	(-1.510)

Note: t-values in parenthesis.

4.G Lag length determination for system 2

Table 4.G.1: Lag reduction test

test	test stat	p-value
VAR(4) << VAR(5)	ChiSqr(25) = 105.487	0.000
VAR(3) << VAR(5)	ChiSqr(50) = 152.346	0.000
VAR(3) << VAR(4)	ChiSqr(25) = 46.860	0.005
VAR(2) << VAR(5)	ChiSqr(75) = 206.752	0.000
VAR(2) << VAR(4)	ChiSqr(50) = 101.265	0.000
VAR(2) << VAR(3)	ChiSqr(25) = 54.406	0.001
VAR(1) << VAR(5)	ChiSqr(100) = 253.858	0.000
VAR(1) << VAR(4)	ChiSqr(75) = 148.371	0.000
VAR(1) << VAR(3)	ChiSqr(50) = 101.512	0.000
VAR(1) << VAR(2)	ChiSqr(25) = 47.106	0.005

Table 4.G.2: Information criteria for lag length determination

Model	k	T	Regr	Log-Lik	SC	H-Q	LM(1)	LM(k)
VAR(5)	5	42	30	532.201	-11.994	-15.925	0.346	0.637
VAR(4)	4	42	25	479.458	-11.707	-14.983	0.128	0.051
VAR(3)	3	42	20	456.028	-12.816	-15.437	0.042	0.649
VAR(2)	2	42	15	428.825	-13.746	-15.711	0.367	0.336
VAR(1)	1	42	10	405.272	-14.849	-16.159	0.288	0.288

SC: Schwarz Criterion
H-Q: Hannan-Quinn Criterion
LM(k): LM-Test for autocorrelation of order k

4.H Misspecification tests for UVAR $k = 2$, system 2

Table 4.H.1: Autocorrelation test

Test	test statistic	p-value
LM(1)	ChiSqr(25) = 21.508	0.664
LM(2)	ChiSqr(25) = 26.459	0.383
LM(3)	ChiSqr(25) = 29.378	0.248
LM(4)	ChiSqr(25) = 25.606	0.429

Note: Variables are measured in logs of deflated values. The null of no autocorrelation cannot be rejected for all four lags.

Table 4.H.2: Multivariate heteroskedasticity and normality tests

Test	test statistic	p-value
	Test for ARCH	
LM(1)	ChiSqr(225) = 193.465	0.937
LM(2)	ChiSqr(450) = 457.196	0.397
LM(3)	ChiSqr(675) = 675.000	0.493
LM(4)	ChiSqr(900) = 675.000	1.000
	Test for Normality	
	ChiSqr(10) = 22.777	0.012

Note: Variables are measured in logs of deflated values. The null of homoskedastic errors cannot be rejected at any lags. Normality is rejected.

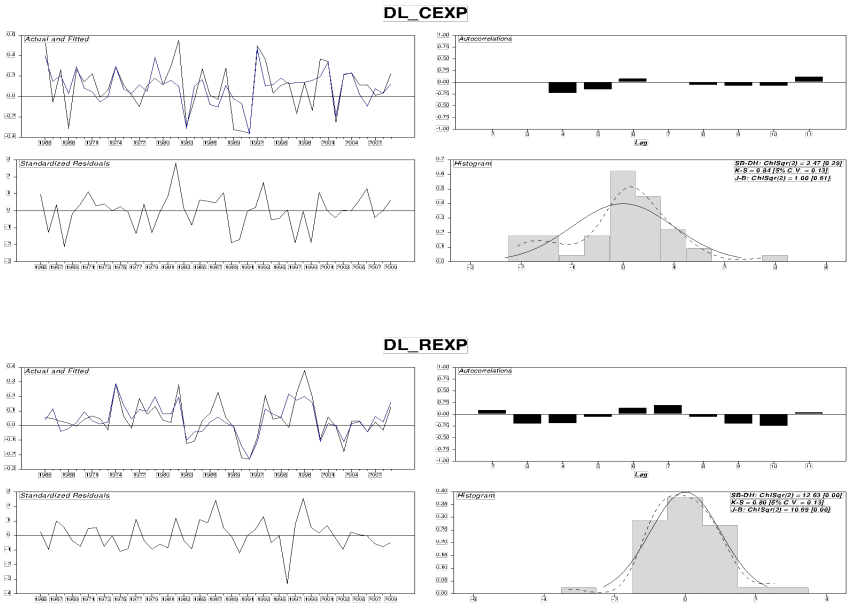
Table 4.H.3: Univariate heteroskedasticity and normality tests

Variable	Skewness	Kurtosis	ARCH(2)	Normality	R^2
cexp	-0.136	3.471	0.957 (0.620)	2.469 (0.291)	0.511
rexp	-0.133	4.986	3.547 (0.170)	12.630 (0.002)	0.693
domrev	-0.717	3.639	2.968 (0.227)	4.239 (0.120)	0.537
grants	-0.328	2.907	0.119 (0.942)	1.032 (0.597)	0.506
loans	0.006	2.454	1.046 (0.593)	0.089 (0.956)	0.518

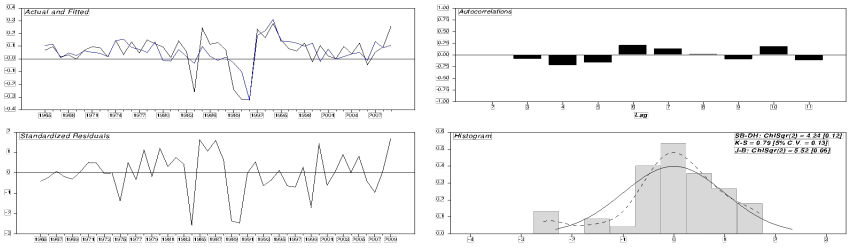
Note: Variables are measured in logs of deflated values. P-values in parenthesis when relevant.

4.I Residual plots for system 2

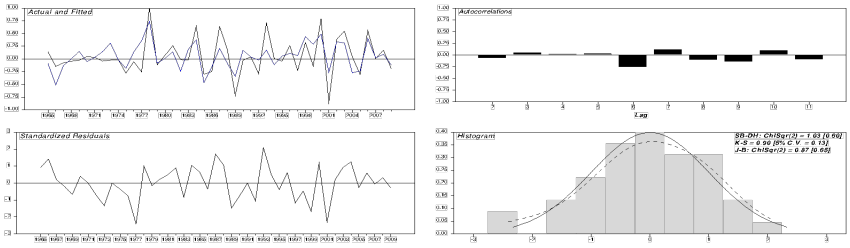
Figure 4.I.1: Residual plots for system 2



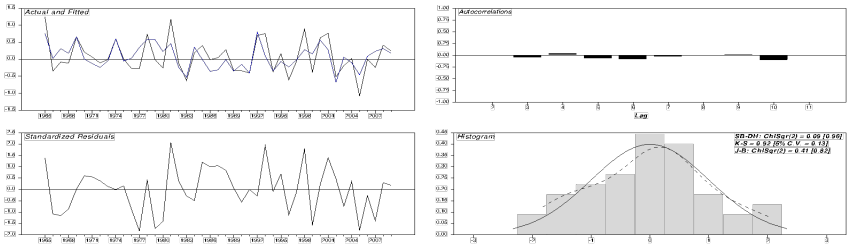
DL_DOMREV



DL_GRANTS



DL_LOANS



4.J LR results for system 2 with $r = 4$

Table 4.J.1: LR results on beta for system 2 and $r = 4$

	cexp	rexp	domrev	grants	loans	1974	1991
The beta vectors before normalization							
Beta(1)	98.569	14.935	-159.126	0.000	0.000	0.000	0.000
Beta(2)	-99.862	0.000	0.000	92.391	69.390	0.000	-79.102
Beta(3)	0.000	-13.297	0.000	4.860	3.095	5.634	0.000
Beta(4)	0.000	0.000	-150.345	91.698	72.382	0.000	-79.167
The beta vectors normalized							
Beta(1)	-0.619	-0.094	1.000	0.000	0.000	0.000	0.000
	(-127.005)	(-12.584)	(.NA)	(.NA)	(.NA)	(.NA)	(.NA)
Beta(2)	1.000	0.000	0.000	-0.925	-0.695	0.000	0.792
	(.NA)	(.NA)	(.NA)	(-6.937)	(-7.324)	(.NA)	(4.283)
Beta(3)	0.000	1.000	0.000	-0.366	-0.233	-0.424	0.000
	(.NA)	(.NA)	(.NA)	(-10.011)	(-6.184)	(-6.916)	(.NA)
Beta(4)	0.000	0.000	1.000	-0.610	-0.481	0.000	0.527
	(.NA)	(.NA)	(.NA)	(-6.785)	(-7.519)	(.NA)	(4.244)

Note: t-values in parenthesis.

Table 4.J.2: LR results on alpha for system 2 and $r = 4$

	Alpha(1)	Alpha(2)	Alpha(3)	Alpha(4)
cexp	-8.776	-5.773	-0.770	8.862
	(-2.241)	(-2.349)	(-2.354)	(2.397)
rexp	4.091	2.368	-0.227	-3.308
	(2.499)	(2.306)	(-1.658)	(-2.141)
domrev	-2.235	-1.191	-0.312	1.984
	(-1.047)	(-0.889)	(-1.752)	(0.985)
grants	10.338	7.114	1.658	-10.352
	(1.681)	(1.844)	(3.231)	(-1.784)
loans	-22.158	-14.096	-0.836	22.037
	(-2.755)	(-2.793)	(-1.244)	(2.902)

Note: t-values in parenthesis.

4.K LR results for system 2 without dummies

Table 4.K.1: LR results on beta for system 2 without dummies

	cexp	rexp	domrev	grants	loans
The beta vectors before normalization					
Beta(1)	22.948	5.133	-37.872	0.000	0.000
Beta(2)	3.959	0.000	0.000	-2.660	-2.239
Beta(3)	0.000	10.017	0.000	-2.723	-4.879
The beta vectors normalized					
Beta(1)	-0.606	-0.136	1.000	0.000	0.000
	(-13.432)	(-1.825)	(.NA)	(.NA)	(.NA)
Beta(2)	1.000	0.000	0.000	-0.672	-0.565
	(.NA)	(.NA)	(.NA)	(-5.218)	(-5.531)
Beta(3)	0.000	1.000	0.000	-0.272	-0.487
	(.NA)	(.NA)	(.NA)	(-3.534)	(-7.954)

Note: t-values in parenthesis.

Table 4.K.2: LR results on alpha for system 2 without dummies

	Alpha(1)	Alpha(2)	Alpha(3)
cexp	0.165	-0.182	0.180
	(0.385)	(-1.023)	(0.620)
rexp	0.749	0.348	-0.464
	(3.934)	(4.412)	(-3.583)
domrev	-0.246	0.052	-0.067
	(-0.994)	(0.507)	(-0.398)
grants	-0.370	0.044	0.365
	(-0.570)	(0.164)	(0.827)
loans	-0.116	-0.286	1.379
	(-0.134)	(-0.794)	(2.333)

Note: t-values in parenthesis.

Chapter 5

Tax incentives, lobbying and political connections: firm level evidence from Ethiopia

5.1 Introduction

This chapter takes a microeconomic perspective on tax revenue mobilisation by looking at the tax take at the firm level in Ethiopia. In particular the focus is on the determinants of effective tax rates (ETR), broadly defined as the ratio of business profit taxes paid by the firm to its income (The Tax Policy Center, 2011). They are a measure of the tax burden on firms, or of the tax take for each firm, according respectively to the firms' or the government's point of view. The main aim of this chapter is to understand what determines ETRs, including both legal provisions, such as the statutory tax rate and tax benefits, and the firm's activity in terms of lobbying and political connections. By doing this I aim at identifying possible constraints to tax revenue mobilisation at the firm level in Ethiopia and potential areas for reform.

The focus of the analysis is on business profit tax. While this is not the only tax paid by firms, it is the most relevant one since it is the only one diretly paid by the firm. Other taxes, such as labour income taxes and social contributions, are paid by the firm on behalf of employees while others, such as indirect taxes, are eventually charged on the consumer through an increase in prices. Therefore firms are primarily affected by business profits tax, that is also the policy instrument used for fiscal incentives such as exemptions and tax holidays.

Business profit taxes in Ethiopia amount to 17% of total tax revenue and to about

half (49%) of direct taxes. They are therefore already a substantial share of total revenue and, perhaps more importantly, they have the potential to contribute even more to the government's budget in the future. Indeed the manufacturing sector in Ethiopia is still rather limited in size, as in other African countries, and it contributed only about 5% to GDP in 2009[1]. Therefore business profits tax can reasonably be expected to become increasingly important, as the manufacturing sector expands as foreseen in the current development plan (GTP, Growth and Transformation Plan).

Moreover business profits tax has received much attention particularly in the debate on international tax competition, tax evasion and the interaction of international tax systems both in advanced and developing economies. On the one hand in advanced economies the main concern of the literature is to provide evidence on the equity in the distribution of the tax burden, and particularly on whether big corporations pay their fair share of tax (see for example Citizens for Tax Justice (1985)). On the other hand, developing countries face the additional challenge, along with equity, to ensure a sufficient level of tax revenue to carry out the basic functions of the state and more generally to finance development expenditure.

In presence of a relatively small tax base for business profits tax, it is particularly important to ensure that tax competition and tax benefits do not harm the efforts towards increased domestic revenue mobilisation in Africa. Many low income countries have adopted exemptions to attract investment and this has indeed reduced the tax base. This in turn may imply a higher tax burden for those who do pay tax and thus stronger incentives to evade (Gauthier and Reinikka, 2006). In this context, the general consensus on the objectives of tax reform revolves around three broad elements: increasing the tax base, reducing tax rates, and reducing exemptions and exceptions to a minimum deemed necessary. Ethiopia has worked towards these principles with the 2002 tax reform that brought the corporate tax rate down from 35% to 30% and introduced stricter rules on tax evasion, which ultimately should result in an increased tax base. Increasing the tax base however is not only a tax policy issue but also an industrial policy one. As far as tax policy is concerned, and besides the fight against evasion, a general reduction of exemptions will also lead to an increase of the tax base since it would increase firms' taxable income.

In this context, this chapter contributes to the policy debate and to the literature

[1]Note that business income tax is levied on the industrial sector as a whole and not only on the manufacturing sector, thus including for example utilities and construction besides manufacturing, and on large agricultural projects as well.

in three ways. Firstly it offers a quantification of effective tax rates and an estimate of the effects of its determinants, including lobbying and political connections. Evidence on business profits tax for Africa is extremely rare, as only two other studies have been carried out on African countries but with much smaller samples (Gauthier et al., 2002; Gauthier and Reinikka, 2006). This evidence is useful to assess the potential for increasing tax revenue from the manufacturing sector and it represents a starting point for policy reform.

Secondly a unique census dataset is used, including firms observed over 14 years from 1996 to 2009, thus having a substantial advantage with respect to other studies on Africa. This long panel potentially allows better estimates than other studies in the litertaure both because of a larger sample size and the possibility of accounting for firm fixed effects. The availability of data in the African context is ensured by the use of surveys rather than accounting data for listed firms, which is more commonly used in the ETR literature (see sections 5.2 and 5.4). This choice is discussed in section 5.4.

Finally this chapter contributes to the literature by paving the way for further studies on effective tax rates in Africa and more generally in developing countries. Section 5.3 proposes a theoretical framework that guides the analysis and that can potentially be the basis for other similar studies. Providing evidence on ETR that is specific to Africa is particularly important in light of the findings in Abbas et al. (2012), showing that the continent presents different trends in corporate income taxation than other regions of the world. They show that not only the tax base has narrowed in Africa, but also that the widespread use of tax incentives has brought effective tax rates close to zero in many countries. This chapter is therefore a first step in providing country specific evidence on the level of effective tax rates, particualrly for the case of Ethiopia.

Finally, this research is particularly relevant at a time when tax revenue mobilisation is widely recognized as one of the objectives of aid and development policy (House of Commons International Development Committee, 2012).

5.2 Literature review

The firm level literature in Africa has developed in the last two decades particularly since the World Bank enhanced its effort in collecting firm level data, thus allowing more empirical work that is widely reviewed in Bigsten and Soderbom (2005). The focus has been mainly on firms' performance, its determinants and its constraints (Carlin et al., 2006; Siba and Söderbom, 2011; Bigsten and Gebreeyesus, 2007; Dollar et al., 2005; Fafchamps

and El Hamine, 2004), as well as trade and exports (Bigsten et al., 1999; Elbadawi et al., 2006; Bigsten et al., 2009). However this literature is only marginally concerned with corporate taxation[2]. Therefore the main reference literature for this work is the one specifically focussed on ETR, that is reviewed in this section in detail.

The ETR literature originates in the Unites States to inform and influence policy making about existing inequities in the tax system. *Citizens for Tax Justice* carried out a number of descriptive studies, amongst which Citizens for Tax Justice (1985), arguing that large corporations in America were not paying their fair share of tax. The early literature focuses exclusively on the ETR-size relation using largely descriptive techniques rather than regression analysis (Zimmerman, 1983; Porcano, 1986; Wang, 1991; Kern and Morris, 1992). All these studies focus on the US and the results are conflicting. Particularly Zimmerman (1983) finds a positive relation between size and ETR while Porcano (1986) finds a negative one. Wilkie and Limberg (1990) explained the difference in these results on the basis of the empirical methodology. Later Kern and Morris (1992) showed that the results from Zimmerman (1983) are more robust than those in Porcano (1986), but that the effect of size decreased in the late 80s and it then became insignificant. Wang (1991) argues that net operating losses (NOL) should be included in the analysis to avoid a positive bias. Gupta and Newberry (1997) confirm this view and they argue that the omission of NOL may induce a positive bias in size to the extent that small firms are more likely to incur losses due to their lower diversification. Stickney and McGee (1982) introduce more variables in the descriptive analysis, namely capital intensity, leverage, extent of foreign operations, natural resource involvement. They find that size does not play an important role in explaining differences in ETRs but leverage and capital intensity are negatively associated with it.

The article by Gupta and Newberry (1997) is the first attempt at providing a multivariate regression analysis using panel data. In particular the authors add to the analysis variables related to the capital structure, such as capital intensity and leverage; to the asset mix, namely inventory intensity; and other variables such as firms' performance (namely ROA, the return on assets) and the firm's extent of involvement in research and development activities. The authors support the results in Zimmerman (1983) and Kern and Morris (1992) by finding a positive and significant relation between ETR and size before

[2]The only area of this literature concerned with taxation is the work on tariffs. For example Bigsten et al. (2009) use Ethiopian data to show that tariff reductions have a positive effect on total factor productivity. Moreover they find that the reduction of tariffs further results in smaller and more capital-intensive firms.

a tax reform occurred in 1986. After this reform however the relation turns to negative, and still significant. However when the authors consider only the subsample of firms with longer histories, they find that size does not have a significant effect either before or after the 1986 reform. Capital intensity and research and development intensity are consistently significant and negative across specifications, while firms' performance and the asset mix have a positive and significant coefficient.

Finally research on the US has also focused on state level revenue, a literature that is comprehensively reviewed in Hofmann (2002). For example Gupta and Mills (2002) look at the effect of multistate tax planning on the ETR but they also include other variables in the regression. They find a positive and significant coefficient on size although it is not robust to changes in specification. Capital intensity is always negative but never significant.

The literature on the USA discussed so far is summarized in the first part of table 5.2.1. The table focuses on the results on size, that are the most conflicting ones in the literature. Despite the disagreement on the effect of this variable, most results support a positive relation in the US. Table 5.2.1 also includes studies on other advanced countries and emerging economies, reported respectively in the second and third part of the table.

Table 5.2.1: Results on size in the literature

Reference	country	effect of size
Zimmerman (1983)	USA	+
Porcano (1986)	USA	-
Kern and Morris (1992)	USA	+
Omer et al. (1993)	USA	+
Stickney and McGee (1982)	USA	n.s.
Gupta and Newberry (1997)	USA	n.s.
Gupta and Mills (2002)	USA	+
Holland (1998)	UK	+
Wilkinson et al. (2001)	New Zealand	+
Richardson and Lanis (2007)	Australia	-
Kim and Limpaphayom (1998)	Pacific	-
Derashid and Zhang (2003)	Malaysia	-
Adhikari et al. (2006)	Malaysia	-
Guha (2007)	India	-
Wu et al. (2012)	China	+

Note: n.s. means that size did not result to be significant

As far as other advanced economies are concerned, Holland (1998) finds that in the UK generally a negative relation exists between ETR and size although firms in the highest

decile have larger ETR. The author also finds evidence of sectoral differences in that firms in the mining sector face higher ETRs. Wilkinson et al. (2001) focus on the effect of the 1993 reform of the dividend imputation system in New Zealand. They find that size has a positive but not always significant effect. This result however is contradicted, in the case of Australia, by Richardson and Lanis (2007) who find a negative and significant effect there. Otherwise the results of both Wilkinson et al. (2001) and Richardson and Lanis (2007) are largely consistent and in line with the literature, particularly as far as leverage (−), capital intensity (−) and performance (+) are concerned.

As far as developing countries are concerned, the ETR literature has developed only recently and mostly on emerging Asian economies. Kim and Limpaphayom (1998) is the first attempt at providing some evidence on ETR and firm size for the emerging countries of the Pacific. In particular the authors use data for all firms, excluding financial ones, listed in the stock exchange in Hong Kong, Korea, Malaysia, Taiwan and Thailand. The authors focus on size and they test whether the political cost hypothesis, postulating a positive relation between ETR and size[3], is applicable to developing countries. Supported by a negative coefficient on size, they suggest that while this hypothesis may be valid in the US, it is not for developing countries. Indeed governments in the latter group of countries may require more the cooperation of big firms to achieve national economic goals and therefore they would provide fiscal incentives for big firms (thus resulting in a negative relation between ETR and size). This study in addition confirms that firms' performance has a positive effect on ETRs but fails to find a significant relation with leverage.

Taking up the indication in Kim and Limpaphayom (1998) that industry effect may be an important determinant, Derashid and Zhang (2003) focus on sectoral differences in ETR in Malaysia. The sectors are defined relatively broadly and, for example, manufacturing is considered a sector in itself, along with mining, finance and construction. Sectoral differences are found to matter, with the manufacturing sector paying less tax than any other sector. The negative result on size for Pacific countries is confirmed here, although it is not robust. Leverage and capital intensity have the expected negative effect, while performance has a negative coefficient contrary to the rest of the literature. This last result and the one on size set a basis for the authors to suggest that indeed significant differences may exist between developed and developing countries.

Adhikari et al. (2006) use a dataset of Malaysian firms listed in the Kuala Lumpur

[3]For more details on the political cost hypothesis also see section 5.3.

Stock Exchange and observed over a 10-year period. This article adds to the 'standard' variables two measures of political connections, on the grounds that these would be crucial in ensuring a more favorable tax treatment. The first is the percentage of government ownership in a firm. The second is a proxy based on informal ties of a firms directors with leading politicians. The results for both measures are negative and significant, suggesting that indeed these variables should be included in the model. The results previously found on Malaysia on capital intensity (−), leverage (−) and performance (−) are confirmed. None of the sector dummies is significant except for the one on the manufacturing sector that has a negative coefficient. Wu et al. (2012) expand the evidence on political connections by studying Chinese listed firms from 1999 to 2007. To capture this aspect, the authors first distinguish between publicly and privately owned firms. They then obtain a proxy for politically connected managers based on whether they previously served in the government or in the military. They find that the presence of politically connected managers help private firms obtain tax benefits but that it does not have any effect for state owned enterprises. This may suggest that these enterprises can already benefit from connections just by being publicly owned. While previous results for developing countries are confirmed, size here displays a positive and significant coefficient across all models. The authors also include growth to capture performance and managers' characteristics (age and education) but find no significant effect in neither.

Moreover Guha (2007) uses a database of Indian manufacturing firms and finds that size has a negative coefficient, and the usual results on capital intensity and leverage are confirmed. In addition the author includes, along with the standard variables, also a measure of export intensity measured as the ratio of as exports to total sales. This variable is found to have a negative coefficient, thus suggesting that firms that export more also benefit more from tax incentives. It is worth noting that although Gupta and Newberry (1997) did not include this variable, they suggested that foreign operations should be taken into account. Along these lines Bauman and Schadewald (2001) adopt a descriptive approach to explore how the activity of American firms in jurisdictions with different tax regulations affects ETR.

Last but not least, it is important to note that throughout the literature an effort has been made to identify the effect of tax reform on ETRs (Gupta and Newberry, 1997; Wu et al., 2012; Richardson and Lanis, 2007; Guha, 2007; Wilkinson et al., 2001) by including either a variable that captures its effect or its interaction with size, to check whether reform was successful in tackling possible inequalities in the system, or both.

As far as Africa is concerned, very few studies have looked in detail at ETR and they have not been fully in line with the literature reviewed here. The work that is closest to the ETR literature for Africa is an article by Gauthier and Reinikka (2006), using survey data from Ugandan firms. The authors estimate a system of three simultaneous equations using 3SLS methods to explore the effect of size on firms' tax payments. However they depart from the literature in two ways. First, they consider tax payments including also social security contributions and sales tax/value added tax along with corporate income tax. By doing this the effective tax rate paid by the firm is largely inflated, mainly due to sales tax/VAT. Indeed the authors show that of the 6.6% average tax burden (share of sales value), five percentage points are represented by sales tax. Secondly the authors do not estimate the direct effect of size on ETR but they look at the indirect effect through exemptions and evasion. This exercise is possible thanks to specific information on tax evasion and exemptions in the datset that however contains a limited number of observations (147 when looking specifically at ETR).

Contribution

This chapter contributes to the ETR literature in two ways. Firstly it provides evidence on Africa, which is extremely scarce so far. The importance of providing regional specific evidence has been highlighted in the literature. Moreover it has already been suggested that Africa may display different patterns (Abbas et al., 2012), thus the further relevance of expanding the literature to this region. Secondly, it brings an economic perspective to a theme largely debated in accounting journals. While the accounting concepts are taken into consideration, a theoretical framework is developed both to specify the economic mechanisms that define effective tax rates and to allow a clear formulation of testable hypotheses. More generally, this work aims at shedding light on corporate taxation in Africa, a topic largely recognized for its relevance but at the same time virtually ignored in the empirical firm-level literature.

5.3 Theoretical framework and hypotheses

The main actors in this theoretical framework are the government and firms. The former produces a complex system of tax laws and regulations that reflect its objectives and the political negotiation with firms. Within this system, all firms face the same statutory tax rate but they may have different ETRs and thus a different tax burden. It is also possible that, keeping the tax system constant, the ETR faced by the same firm changes in different

periods according to differences in behavior. In other words, while firms respond to the overall tax system as set out by laws and regulations, the actual ETR they face is a result of their action.

The remainder of this section goes into details regarding the definition and determinants of ETR (section 5.3.1); it describes the explanatory variables that are expected to influence the ETR (section 5.3.2); and it proposes the empirical model and the testable hypotheses stemming from the theoretical discussion (section 5.3.3).

5.3.1 The average effective tax rate

As anticipated in the introduction (section 5.1), the effective tax rate for firms is defined as corporate income tax payments divided by pre-tax income, which essentially corresponds to profits. The standard choice in the literature is to only include income tax in the numerator, namely business profit tax. This is justified by the focus on exemptions and other fiscal benefits, since special regimes and industrial policy mostly take place in the area of corporate income tax. This is indeed the case in Ethiopia, where fiscal incentives are set mainly through the business profits tax. The concept of tax expenditures captures this aspect of public policy. In particular, they are defined as "revenue losses attributable to tax provisions that often result from the use of the tax system to promote social goals without incurring direct expenditures" (The Tax Policy Center, 2011). These goals may include for example the development of a particular sector, incentives to investment in general or in a particular region.

By ETR the literature usually refers to the average effective tax rate, as defined in this section, as opposed to the marginal effective tax rate. The latter is defined as the percentage of the expected return on an additional investment that is expected to be paid in tax (Spooner, 1986). Change in behavior, including incentives to investment, are usually achieved through marginal tax rates. However the use of the average ETR instead is grounded on computational simplicity and on the fact that it is better suited to assess the overall tax burden of a firm. The remainder of the chapter therefore refers to ETR as average effective tax rates.

As far as the numerator of the ETR is concerned, the tax payment of a firm in a given year is the sum of current and deferred tax where the latter includes reductions and the effect of tax credits (Stickney, 1979). Deferred tax is an accounting concept[4] emerging

[4]It does not refer to parts of the tax bill that authorities allow the firm to pay with a delay.

from differences between the time when expenses and revenues are included in accounting calculations and the time when they are included in tax calculations[5]. In this chapter the ETR is defined using the whole tax payment, therefore including both components. Studies that adopt different measures of tax payments (including or excluding, partly or entirely, deferred tax) to check for robustness, generally find that the results are consistent regardless of the measure used. Therefore they suggest that this issue is not a concern in this analysis. For a more detailed discussion on the treatment of current and deferred tax in the literature, see appendix 5.A. The extent of deferred tax also depends on the specific provisions of the tax system and they are explored in detail for Ethiopia in section 5.5.1.

As far as the denominator of the ETR is concerned, it is useful to clarify the difference between pre-tax (or book) income and taxable income. The former is essentially revenue net of costs of production and other expenses, therefore essentially capturing profits, and it can be used as an indicator of firms' performance as well. The difference with taxable income essentially lies in exclusions, exemptions, tax holidays and other deductions. These include for example accelerated depreciation or investment tax credits that allow a deduction of certain investment items from taxable income. The statutory tax rate is then applied to taxable income. The elements that determine the difference between book income and taxable income are generally referred to as tax preferences (Wilkie, 1988). Most studies in the literature use book income at the denominator although Stickney (1979) suggests the use of estimated taxable income at the denominator. This is computationally burdensome when all necessary information on tax preferences is not readily available. Moreover by taking the ratio of tax payments on taxable income one should obtain the statutory tax rate, if no evasion and/or corruption is taking place.

Based on these definitions, the average effective tax rate can be described by the following formula:

$$ETR = \frac{TPay}{PTI} = \frac{(PTI - TP)\tau}{PTI} \tag{5.1}$$

where:

TPay = tax payment

PTI = pre-tax income (or profits)

[5]The most common case of deferred tax is depreciation that usually occurs more slowly for accounting purposes than for tax purposes. One extreme case is the UK between 1972 and 1984, where a 100% depreciation allowance was applied on machinery and plant in the year of purchase. This gives rise to a situation where the depreciation is charged slowly for accounting purposes but the tax reduction is taken immediately (James and Nobes, 2009). In this extreme example, the deferred tax is the portion of the immediate tax reduction that is spread over the years of accounting depreciation.

TP = tax preferences

τ = statutory tax rate

Equation 5.1 can be rewritten as follows:

$$ETR = \frac{TPay}{PTI} = (1 - \frac{TP}{PTI}) \cdot \tau \tag{5.2}$$

Equation 5.2 shows that the effective tax rate is essentially composed of two elements: the statutory tax rate and the share of tax preferences on pre-tax income. The first one does not vary across firms in the same year. However it may vary in time as a result of tax reform. The second one is essentially a measure of tax benefits normalized on profits. If all firms face the same tax benefits, this share would not vary across firms. However this is normally not the case, as tax preferences are available for example for firms that operate in certain sectors or regions, or that engage in certain types of investment. In addition the behavior of firms differ, influencing this share as well[6]. This ratio can therefore be expected to vary both across firms and in time. Equation 5.2 implies that, holding TP constant, an increase in profit increases the ETR. Similarly, holding PTI constant, an increase in tax preferences decreases the ETR. The main insight is therefore that the ETR is influenced not only by the statutory tax rate and tax preferences, but also by pre-tax income if TP and PTI are not perfectly correlated (Wilkie, 1988).

5.3.2 The explanatory variables

Based on equation 5.2, the next paragraphs identify what are the variables that influence the ETR, or more precisely its components on the RHS of the equation. These are namely: the statutory tax rate (τ) and the share of tax preferences ($\frac{TP}{PTI}$).

As far as the statutory tax rate is concerned, it is possible to capture its effect by including tax reform as an explanatory variable. This essentially captures the same information as the statutory tax rate, provided that it does not vary across firms but only in time. Tax reform was carried out in Ethiopia in 2002 and one of the main provisions was a decrease of the statutory tax rate from 35% to 30% (see section 5.5 for more details). Theoretically, such a policy has the effect of decreasing the ETR. The reality may not be as straightforward however. First, tax reform is usually comprehensive and includes

[6]Differences in ETRs across firms may be due to timing or to 'permanent' differences. The former refers to deferred taxes and it will fade away in the future while the latter will not. In this sense they can be called 'permanent' although they can vary in time (Spooner, 1986). By including all tax expense, i.e. both current and deferred, the timing differences should be canceled.

many different aspects of tax policy that may have different effects on the ETR. The interpretation of the coefficient on reform has to take into account all of these aspects. It is therefore crucial to understand the relevant tax reform in detail (see section 5.5). A second and related point refers to the Laffer curve, that postulates an inverse U shaped relation between the statutory tax rate and tax revenue (Laffer, 2004). This is explained by the fact that a decrease in the tax rate has two effects: an arithmetic and an economic one. The arithmetic effect leads to a decrease in tax revenue by the amount of the decrease in the tax rate. The economic effect is instead an increase in tax revenue due to a greater incentive to work and make profits and generally to an increase in the tax base. The Laffer curve in itself does not postulate if a decrease in tax rates will increase or decrease tax revenue. The tax response depends on various factors, including the tax system in place, the ease of movement to and from informality, and characteristics of the productive factors. However the curve shows that a positive effect of a cut of the tax rate is entirely possible and sensible (Laffer, 2004).

The share of tax preferences can be influenced by firms in two main ways: tax minimizing strategies and lobbying. First they can and do adopt tax minimizing strategies (Hofmann, 2002) that involve most notably choices on investment, financing and capital intensity. For example, a firm may invest in a more energy efficient technology or in a certain region, knowing that there are fiscal benefits attached to it. More generally new investments may benefit from tax preferences. Firms can also decide the level of financial leverage to minimize tax. Finally capital intensive firms may have lower ETRs because of tax-deductible interest payments and accelerated depreciation relative to the assets' life (Derashid and Zhang, 2003).

Secondly firms can affect ($\frac{TP}{PTI}$) by lobbying the government to obtain additional fiscal benefits, resulting in an incrase in TP. Lobbying is difficult to measure but its effect can be captured in practice by three variables: public ownership, size and age. It has been shown that accounting for political connections is important in understanding the mechanisms through which firms can obtain fiscal benefits and more generally a favorable treatment, for example in competing for government contracts (Faccio, 2006; Fisman, 2001). Obtaining government contracts in turn would have fiscal benefits, as for example in the case of Ethiopia revenues obtained from the government are exempted. One of the most common indicators for political connections is public ownership, as it may grant more direct channels to government officials. Ideally managers' personal connections would be included in the analysis as well, to identify the potential for effective lobbying. However

data on this variable is not easy to obtain and only two of the reviewed papers include such personal connections (Adhikari et al., 2006; Wu et al., 2012). Size can also influence the ability and the effectiveness of lobbying. In particular the 'political power hypothesis' postulates a negative relation between ETR and size, on the grounds that larger firms enjoy a higher bargaining power in negotiating with the government and that they have greater resources to devote to tax minimizing strategies (Richardson and Lanis, 2007). Age can also influence lobbying because older firms may have a more established network of connections.

Finally it may be useful to note that tax evasion is not directly included in the equation because of its unobservability and lack of data. However it may be possible to identify variables that are likely to influence it. In particular size and public ownership can influence the probability and extent to which firms engage in tax evasion, besides influencing lobbying. As far as size is concerned, and opposed to the negative effect postulated by the political power hypothesis, the 'political cost hypothesis' postulates a positve relation between ETR and size instead (Zimmerman, 1983). This relation is explained by the greater visibility of large firms that makes it more difficult for them to escape the tax net through evasion. Along the same lines, public ownership may also have an effect on evasion because of higher visibility to authorities. For example public owned firms may employ persons who are directly related to the government, therefore tightening up the control from within.

The fact that public ownership and size affect both tax preferences, though lobbying, and evasion should be kept in mind when interpreting the results. In the case of size, the sign of the relation with ETR would be different if the channel is lobbying or tax evasion, respectively negative according to the political power hypothesis and positive according to the political cost one. In the case of public ownership, if the effect occurs through lobbying a lower ETR can be expected (i.e. negative relation) while if it occurs through evasion the coefficient would be positive.

So far the 'core variables' of the model have been identified as: reform, capital intensity, financing decisions, investment, public ownership, age and size. In addition to these, there may be other variables that are less directly related with the (TP/PTI) ratio but that are worth including in the model to check their significance. First, firms' performance may influence the ETR and it can be captured, amongst others, by growth in sales or the presence of losses[7]. The expected effect of performance indicators on the ETR however

[7]Note that net operating losses (i.e. negative profits) in one year influence the ETR in the future when

is unclear. On the one hand governments might want to put obstacles to large firms to avoid them being too powerful (i.e. negative relation between performance and ETR). On the other hand they may also want to set incentives for them due to their contribution to growth and employment (i.e. positive relation).

Moreover foreign connections in terms of export or of presence of foreign capital may matter, according to the government's views on exports and foreign investment. Finally some characteristics of the owners, besides the public or private nature, may be relevant to include. In particular the number of owners is considered.

5.3.3 Core model and research questions

The framework discussed in the previous sections leads to a reduced form equation that stems from equation **??** and that is the basis of the econometric exercise.

$$ETR = \alpha + \beta_1 SIZE + \beta_2 CAPINT + \beta_3 INVEST + \beta_4 PUBLIC + \\ + \beta_5 AGE + \beta_6 REFORM + \epsilon \quad (5.3)$$

Equation 5.6 represents the 'core model' for the analysis and henceforth it is referred to as the baseline equation. To this model are going to be added other control variables such as growth, loss, export, foreign capital and owners. Section 5.4 describes the data used to capture each of these variables in detail.

Estimation of the baseline equation and its extensions can shed light on the following research questions, that correspond to the testable hypotheses underlying the analysis.

1. Which hypothesis is more appropriate in explaining the ETR-size relation in Ethiopia: the political cost hypothesis or the political power hypothesis?

2. Can political connections, through public ownership, help firms reduce their tax burden?

3. Reform: can a reduction of the statutory tax rate have a positive effect on the ETR?

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loss carryforwards are allowed. In the case of Ethiopia, losses can be carried forward for three years (see section 5.5.1).

5.4 Data and variables

The data used in this chapter is the census of Ethiopian firms in the manufacturing sector collected by the Central Statistical Agency, namely the Large and Medium Manufacturing Industry Survey (LMMIS). The LMMIS is a unique dataset in the African context as it provides panel data for a large number of firms observed over 14 years, from 1996 to 2009[8]. This data is also used in other studies in the literature although not for analysing tax-related issues (Melese and Waldkirch, 2011; Bigsten et al., 2011, 2009; Bigsten and Gebreeyesus, 2007; Söderbom, 2011; Siba and Söderbom, 2011).

The use of census data is not common in the ETR literature, as the usual source of information is financial statements for firms listed in the stock exchange. Data from financial statements however is not available, nor necessarily relevant, in the African context. In the case of Ethiopia, as of today there is no stock exchange[9]. In other part of Africa where a stock exchange exists, only few firms are usually listed. This is the case for many of Ethiopia's neighbours such as Kenya (50 firms), Tanzania (11 firms) and Rwanda (4 firms). This selection is likely not to be representative of the industrial sector and it may therefore include firms that are systematically different from the population as a whole. In this context census data is preferable as it provides consistent information for the whole population of firms thus avoiding selection problems, at least at the source. Moreover the data included in the LMMIS is still based on accounting forms and it includes all the variables that are necessary for an analysis of ETRs. In addition a clear advantage of the LMMIS dataset is to follow a large number of firms over a relatively long time period, that is rather rare in the African context.

The LMMIS dataset includes establishments that engage 10 persons or more and that use power driven machinery[10]. As the survey is designed to consider only large and medium enterprises, it excludes small and micro ones. At the national level in 2009 large and medium manufacturing represented 70% of the total contribution of manufacturing to GDP (at constant prices)[11]. Given the focus on corporate taxation, considering this

[8] Note that Ethiopia uses the Ethiopian calendar, that is different than the Gregorian one in two main ways: it is seven years behind the Gregorian calendar and it runs from September to August. The first year in the LMMIS dataset therefore corresponds to 1995/96 and to the Ethiopian Fiscal Year (EFY) 1988.

[9] There was some form of exchange during the Imperial period that was dismantled by the socialist regime and never opened again (Tsegaye, 2012).

[10] The number of persons engaged is not necessarily the same as the number of employees, as the former can include for example members of the family working in the firm without a salary. Moreover changes in employment may arise between the time the firm is selected into the survey and the time the survey is actually carried out. Therefore firms can be observed to employ less than 10 persons.

[11] Author's calculation from data provided by the Ministry of Finance and Economic Development.

type of enterprises is important and relevant, as they represent the bulk of manufacturing produciton in Ethiopia.

The LMMIS dataset includes information on taxes[12] paid by firms in the survey year, including a disaggregation between business profits tax and indirect taxes[13]. Note that indirect taxation amounts to about 80% of the total tax take from firms. This may be due to the fact that indirect taxes are relatively easier to collect and they face less opposition from interest groups as they are levied on a large group of mostly non-organized consumers. In addition, fiscal incentives occur mostly as reductions on the business tax burden therefore contributing to explain the lower contribution of this tax type. Total tax payments (business profit tax) as reported in the LMMIS allow the computation of ETRs. However attention should be paid to the possibility of delays in tax collection, reflected in such measure of tax payments, due to exceptional circumstances. This may be the case for example at the peak of the famine in 2002, as shown in section 5.5. Time dummies are one way to capture these exceptional events and robustness is discussed in section 5.8.

The ETR is obtained by taking the ratio of business profits tax payments to profits. Only observations for which tax data is available, i.e. non-missing, can be considered to avoid intruducing errors in the dataset. The possibility that missing values on tax are really zeroes, when all other variables are non-missing, is explored in the robustness section to check whether this choice affets the results (see section5.8). The denominator of the ETR, profits (or a close proxy of it), is calculated as the total value of sales and other revenues minus the following[14]:

- Total wages and benefits to employees;
- Total value of raw materials, spare parts and auxiliary materials;
- Other industrial costs;
- Non industrial costs, including for example commercial and marketing costs;
- The change in the value of fixed assets between the beginning and the end of the year.

[12] Tax data includes all tax paid at both the federal and regional level. The regional components is much smaller than the federal one, contributing only about 20% of total tax revenue. Business profits tax levied on large corporations accrues to the central government by law.

[13] The distinction between current and deferred tax is therefore ignored and they are both included in the measure of total tax payments.

[14] The calculation of profits is restricted to observations for which all the necessary variables are available, to avoid mis-calculations due to missing values.

Turning to explanatory variables, the LMMIS data allows me to measure all the variables identified in the theoretical framework of section 5.3. Firstly size can be measured using sales or employment[15]. These variables are usually transformed in natural logarithms to reduce skewness. The use of sales would introduce exogenous changes due to inflation and not to actual changes in the size of a firm. This is particularly important in Ethiopia, where inflation has often reached double-digit figures in recent years. The preferred measure of size is therefore the number of employees which is the measure used in the main results in section 5.7. The value of sales is also used to test for robustness in section 5.8.

Secondly capital intensity is defined as the ratio of fixed assets to labor. This measure differs from the one most commonly used in the ETR literature, namely the ratio of fixed assets to total assets. However it is commonly used in the firm-level literature using LMMIS data (Bigsten and Gebreeyesus, 2007; Bigsten et al., 2009; Melese and Waldkirch, 2011; Söderbom, 2011) and it is also used in the ETR context, for example in Stickney and McGee (1982).

Note that leverage cannot be measured, as an indicator of financing decisions, due to lack of data. However some information on financing decisions can be included in two ways. On the one hand, the percentage of foreign capital in total capital is included. On the other hand, capital intensity may also capture part of the effect of leverage, which would go in the same direction. This is because more capital-intensive firms may have higher debts to finance their fixed assets and because they can offer a collateral. Note also that the financial sector in Ethiopia is not particularly developed and therefore the level of leverage may be expected to be generally lower, and less relevant, than in other countries.

Moreover investment in fixed assets is included as a percentage of existing fixed assets. This is expected to have a negative sign as investment often benefits from fiscal incentives. Export is included as the ratio of exports to total sales, as in Guha (2007). Growth in employment is also included as an indicator of performance. Political connections are captured through public ownership. Since census data is anonymous, it is impossible to proxy the management's personal connections using LMMIS data. The measure of age can be obtained using the year of commencement of operations, that is reported in the survey questionnaire. As a few inconsistencies are present in the data, the mode of this

[15]Total assets may also be used to measure size. However the LMMIS data reports only fixed assets and not total assets.

Table 5.4.1: Explanatory variables

Variable	Description	Expected sign
Size	Log of number of employees	+ / -
Size (sales)	Log of deflated sales value	+ / -
Capital intensity	Value of fixed assets in millions /number of employees	-
Investment	Investment in fixed assets / fixed assets at the beginning of the period	-
Reform	Dummy=1 after 2002	+
Public ownership (political connections)	Dummy =1 for any public ownership	-
Export	Export / sales	-
Foreign capital	Percentage of foreign capital on total initial capital	-
Age	Years since establishment	-
Owners	Number of owners	+ / -
Loss	Dummy=1 if profits $\leq$ 0 in any year	-
Profits	Log of profits	+
Growth	Growth in employment	+ / -
Sector	Dummies for sectors of operations	
Region	Dummies for Ethiopian regions	
Year	Year dummies	

variable is used[16].

Furthermore, the effect of reform is captured by including a dummy that takes the value of 1 after 2002. This dummy is preferred to the inclusion of the statutory tax rate because the 2002 tax reform in Ethiopia went well beyond a decrease in the tax rate. Therefore using the latter would be misleading, while inclusion of both would result in perfect collinearity. The reform dummy essentially captures the same information but it is more easily and correctly interpreted.

Finally a dummy variable captures the occurrance of losses by taking the value 1 if the firm ever incurred in losses in its history and 0 otherwise. Although this variable is not part of the core model, it is used in some specifications (see section 5.7.5) to capture the

[16]To verify the validity of this choice, I check whether firms are observed before the birth year thus identified. In 99% of cases all other variables are not observed before the firm's birth, thus confirming this choice. An alternative to taking the mode would be to use the earliest year available. The two measures are largely the same but choosing the earliest year introduces a few mistakes when there are typing errors in the data.

effect of negative profits that is otherwise excluded from the analysis. Indeed Wang (1991) and Gupta and Newberry (1997) suggest that losses should be included in the regression as a determinant of the ETR since they generally can be carried forward and offset future profits (see section 5.5 for details on carryforwards in Ethiopia).

The LMMIS data spans from 1996 to 2009, with a gap of only one year in 1997. Despite the relatively long period covered, firms are typically observed only for a few years, with an average of 4.4 years. Table 5.4.2 shows how the sample changes in each year. A firm is coded as a new entry if it was missing in year $t-1$ but is observed[17] in year t. A firm is coded as exiting in year t if it is not observed in that year but was observed in $t-1$. Table 5.4.2 also reports the number of observations in which profits are negative and the sample size for which all the core variables are available.

Table 5.4.2: Sample by year

year	entry	exit	profit<0	sample
1996	-	-	116	457
1998	285	183	184	420
1999	139	130	202	354
2000	176	188	208	417
2001	143	110	229	482
2002	275	122	240	583
2003	75	440	121	236
2004	176	127	122	10
2005	110	205	96	250
2006	284	116	143	218
2007	291	242	140	231
2008	367	164	161	201
2009	411	363	157	259

5.4.1 Sample selection

The sample is composed of 750 firms and 3300 firm-year observations, with an average of 4.4 years per firm. Clearly the sample size may change according to the variables included in the different specifications and therefore the number of observations, as well as the number of establishments (N_g), is always reported in the tables. This sample is

[17] That is, if not all variables used for the computation of profits are observed. While this may not accurately reflect movements into and out of buiness, it does reflect whether the firm enters or exits the sample in a given year. Similar results are obtained when entry and exit are coded according ot whether firms report any sales.

comparable to those used in other studies in the literature using LLMIS data[18], with some differences due to the specific requirements for this analysis. In particular tax variables, including disaggregated tax data (business profits and indirect tax), are not used in other studies in the literature. The calculation of the profit variable is also demanding in terms of data and not all firms report information on investment, ownership and export. Given the high data requirement for this study, only establishments that report a high degree of the information required in the questionnaire can be included in the sample. Selection problems are discussed in section 5.8.

Firms enter the sample according to two main criteria related to the measure of ETR. First, only observations with positive or zero profits are included. This is in line with the ETR literature and it is justified by the fact that including negative profits at the denominator would result in negative ETRs. This would be difficult to interpret and not particularly sensible. More details on this issue can be found in section 5.5 and the effect of negative profits is also explored in section 5.7.3. Secondly, and again in line with the ETR literature, observations that report an ETR larger than 1 are excluded. While this can happen for a number of reasons (see for example Derashid and Zhang (2003) and Zimmerman (1983)), it would however potentially bias the estimates. As a result, 43 observations are dropped from the sample. The robustness of the results to this choice is discussed in section 5.8[19].

5.5 The Ethiopian context and descriptive statistics

5.5.1 The Ethiopian context and corporate tax legislation

The data used in this study spans from 1996 to 2009, a period of relative political and institutional stability. After the fall of the Derg regime in 1991, the country has always

[18] With respect to other studies using LMMIS, three years of data are added and particularly 2007, 2008 and 2009. While direct comparisons may not be sensible because the variables used are different, it may be useful to note that the sample size is in line with the literature going from a maximum of 6500 to a minimum of 1100 observations. For example Melese and Waldkirch (2011) use about 6500 observations, Bigsten et al. (2011) about 4800, Bigsten et al. (2009) 6000, Bigsten and Gebreeyesus (2007) 3800, Söderbom (2011) 5400, (Siba and Söderbom, 2011) 2000 and (Söderbom, 2011) reaches a minimum of 1100 observations in some specifications.

[19] Other unrealistic observations are excluded: those reporting a growth rate larger than 10 (10 observations), those that report a value for exports that is larger than the value of sales (19 observations), and those for which new investment is larger than 10 times the existing value of fixed assets (21 observations). Note that firms that are only observed for one period are naturally dropped to allow the exploitation of the time dimension of the panel dataset. This is the case for 20% of observations, corresponding to 53% of firms that could potentially be included. These observations would necessarily be dropped in the estimation of a fixed effects model (FEM).

been governed by a coalition of parties known as EPRDF (Ethiopian People's Revolutionary Democratic Front) under the leadership of Meles Zenawi until his death in 2012. At the beginning of the sample period, tax policy was regulated by Proclamation 107/1994 that provided for tax rates on business profits of a flat 35% for incorporated businesses and varying according to a schedule with a maximum tax rate of 35% for other entities.

In 2002 the Government of Ethiopia issued a major reform of the tax system that introduced a number of important changes[20]. Three of them are discussed here in particular. First, the new law on income tax (Proclamation 286/2002) decreased the tax rate to a flat 30% for incorporated businesses. Other taxpayers were instead following a schedule with a maximum rate of 35%. In particular, the law distinguishes three types of businesses:

- Schedule A: businesses with legal personality regardless of their annual sales revenue and other businesses having annual sales revenue of 500000 ETB or more.
- Schedule B: businesses with no legal personality and with annual sales revenue between 100000 and 500000 ETB.
- Schedule C: any other business not classified in A or B, that is without legal personality and whose annual sales are less than 100000 ETB.

The flat 30% rate applies to categories A and B, that are also required to maintain proper books of accounts on an accrual basis. A schedule with a maximum rate of 35% instead applies only to category C. Although this information is not reported in the questionnaire, all firms in the sample are expecetd to be in either category A or B.

As noted already in section 5.3, tax policy complements these statutory tax rates with a number of tax preferences allowed by the government in separate regulations. Amongst these, all revenue obtained from the federal, regional or local governments is exempted as well as those from the National Bank of Ethiopia. Moreover the government can grant tax credits in form of a tax deduction of a percentage of the investment or as an exemption for investment in underdeveloped areas.

Secondly, as part of the reform of 2002, the Government of Ethiopia scaled up its efforts to ensure compliance and to fight tax evasion. One of the provisions aimed at this objective is the introduciton of the Tax Identification Number for all taxpayers, particularly businesses. Whether the TIN in particular would have a large effect in this sample

[20]The main references for this section are Tesfaye (2008), Mengesha (2008) and the three proclamations Government of Ethiopia (1994), Government of Ethiopia (2002b), and Government of Ethiopia (2002a).

is unclear as medium and large enterprises were already registered at the Ministry of Industry and Trade before the reform. However the increased effort in fighting tax evasion is likely to affect the firms in the sample.

Thirdly, although this is not directly relevant for this analysis, an important innovation of the 2002 reform was the introduction of VAT with Proclamation 285/2002. The VAT mainly substituted the sales taxes and the turnover tax that firms were already subject to before the reform. The 2002 reform was therefore a comprehensive one, that shows the commitment of the government to increase tax revenue with the broader objective of financing its ambitious development plans.

Two additional elements of the tax system in Ethiopia are relevant for this analysis: loss carryforwards and depreciation rules. The former refers to the possibility for businesses to use the loss in one period to offset profits in later periods. This practice is commonly accepted and Ethiopia is no exception. In particular losses can be carried forward for the next three tax periods, but only a maximum of two three-year periods is allowed. This confirms the validity of the *loss* variable as a proxy for loss carryforwards, particularly as the average period over which firms are observed is 4.4 years. So a loss incurred in time t=1 can be carried forward untill time t=4 unless another loss is recorded in the same period, in which case these losses can be carried forward only until time t=7.

Depreciation rules are relevant because they are one of the most important elements in determining the difference between current tax and deferred tax (James and Nobes, 2009). While depreciation is usually faster for tax purposes than for accounting ones, the extent to which they differ determines the importance of deferred tax (see appendix 5.A for a more detailed discussion on the treatment of deferred tax). The details on depreciation in the Ethiopian tax law are rather complex but for the purpose of this analysis it is sufficient to note that depreciation rates vary from 5% to 20% according to the type of asset[21]. These rates are in line with accounting principles and they therefore do not imply particular difficulties in terms of deferred and current tax.

5.5.2 Descriptive statistics

This section presents a descriptive analysis of the sample used, as defined in section 5.4.1. So for example firm-year observations with negative profits are not included, unless explicitely stated. The variables considered here are particularly those of the core model,

[21] For example, the rate allowed on buildings and construction is 5%, on intangible assets 10%, on machinery and vehicles 20%.

and summary statistics for all variables are reported in appendix 5.B.

Tax take by region and sector

Before getting into the details of the ETR and other variables, it is useful to look at the regional and sectoral composition of firms in the sample. Table 5.5.1 and 5.5.2 show regional and sectoral distributions, in terms of number of observations and of percentage of income tax take from that region or sector. The tables include figures for both the most recent year only, 2008-2009, and for all the years pooled together. In the latter case, figures in the tax take column are the mean contribution of a region or sector to the total tax take over all years. In the case of regions, a zero is reported when firms are observed in a particular region but their contribution is very small, while the *minus* sign indicates that no observations are available for that region. This is indeed the case for Benishangul-Gumuz that has no observation in the sample in any of the years considered. Afar, Somali and Gambela all have only few observations in the pooled sample and none at all in 2009. This should not come as a surprise since these regions are particularly remote and not easily accessible, therefore not making them an attractive location for manufacturing enterprises. The table shows that firms are largely concentrated in Addis Ababa and Oromia, with most firms in Oromia probably concentrated in the areas just outside the capital. These two regions together account for the bulk of observations and for about 90% of the total tax take.

Table 5.5.1: Regional distribution of firms and origin of tax take

	year 2009		mean - all years	
Regions	% of observations	% of total tax take	% of observations	% of total tax take
Addis Ababa	66.5	34.2	63.3	37.0
Oromia	17.7	53.6	14.4	53.3
SNNPR	3.7	0.01	7.5	5.6
Amhara	4.3	5.3	6.3	4.7
Tigray	3	4.2	3.0	0.9
Dire Dawa	1.8	0.3	3.4	0.1
Harari	3	2.2	1.6	2.2
Afar	-	-	0.3	0.9
Somali	-	-	0.3	0
Gambela	-	-	0.2	0
Benishangul	-	-	-	-

As far as sectors are concerned, only the top sectors in Ethiopia are considered for

simplicity, defined as those that most firms in the sample work in. Sectors are defind using ISIC codes at the four-digit level. The sectors considered in table 5.5.2 represent 70% of all observations in 2009 and 63% in the pooled sample. They also account for about half the total tax take in Ethiopia. The top taxpayer sector in the table, with a contribution of over one fifth of the total tax share, is 'Liquors' and more precisely 'Manufacture of malt liquors and malt' that predominantly includes beer. In 2009 this was the second most contributing sector, after the manufacture of cement (ISIC 2694) which contributed 27% of the total tax take. Note that this sector is not the same as 'Cement' in the table, that instead refers to articles in cement and to ISIC code 2695. The third and fourth most contributing sectors, 'Plastic' and 'Soap' in the table, report much lower shares. These figures point to a high concentration of the tax take in a few sectors.

Table 5.5.2: Sector distribution of firms and origin of tax take

	year 2009		mean - all years	
Sector	% of observations	% of total tax take	% of observations	% of total tax take
Print	14.02	3.28	10.56	4.51
Plastic	13.41	5.44	5.45	2.45
Soap	6.71	5.24	3.19	9.22
Furniture	6.71	1.66	12.93	3.72
Flour	5.49	1.95	4.90	1.11
Bakery	5.49	1.47	8.97	3.29
Leather	4.88	1.69	1.92	1.62
Liquors	3.66	21.75	1.98	13.47
Footwear	3.66	0.56	5.11	0.71
Paints	3.05	3.42	1.76	1.90
Cement	3.05	0.80	5.90	3.14
Total	70.12	47.27	62.67	45.14

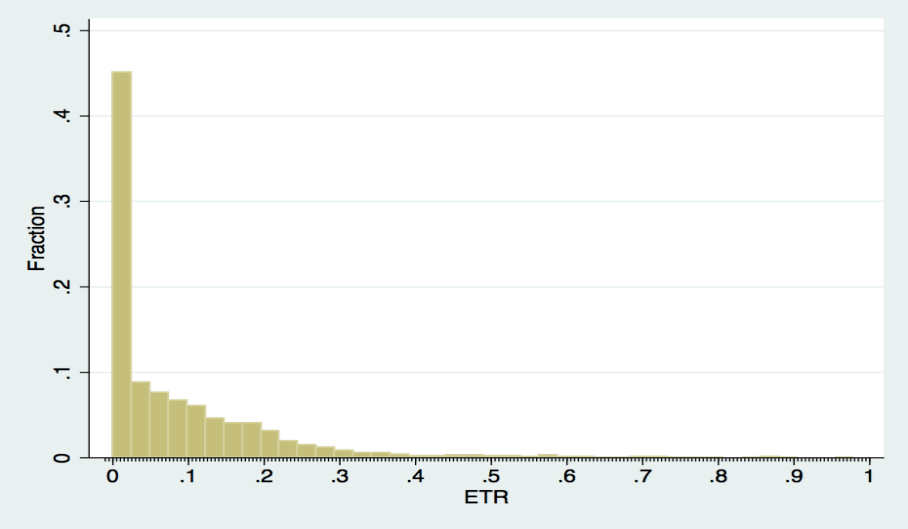
Note: sectors correspond to the ISIC codes in parenthesis: Print (2200), Plastic (2520), Soap (2424), Furniture (3610), Flour (1531), Bakery (1541), Leather (1910), Liquors (1553), Footwear (1920), Paints (2422), Cement (2695).

Descriptive analysis of effective tax rates

Turning now to ETRs more specifically, figure 5.5.1 reports the histogram of the effective tax rate for the pooled sample. The figure shows clearly that most firms in the sample are subject to an effective tax rate that is well below the statutory one. The great majority of firms in the pooled sample (95%) paid an effective tax rate below 30%, that represents roughly the statutory rate (note that this was 35% before the reform of 2002). This figure

is confirmed when looking at 2009, the most recent year in the sample, with 93% of firms facing an ETR lower than the statutory rate in that year. Indeed many firms both in the pooled sample and in 2009 alone face very low ETRs. More than half of all firms in the pooled sample are below an arbitrary ETR threshold of 5% and the corresponding figure for 2009 is 27%. These figures indicate clearly a large discrepancy between the ETR and the statutory tax rate. This descriptive evidence confirms the importance in Africa, and particularly in Ethiopia, of special regimes and tax preferences that has been pointed out in the literature (for example by Abbas et al. (2012)) and in the policy debate.

Figure 5.5.1: Histogram of ETR



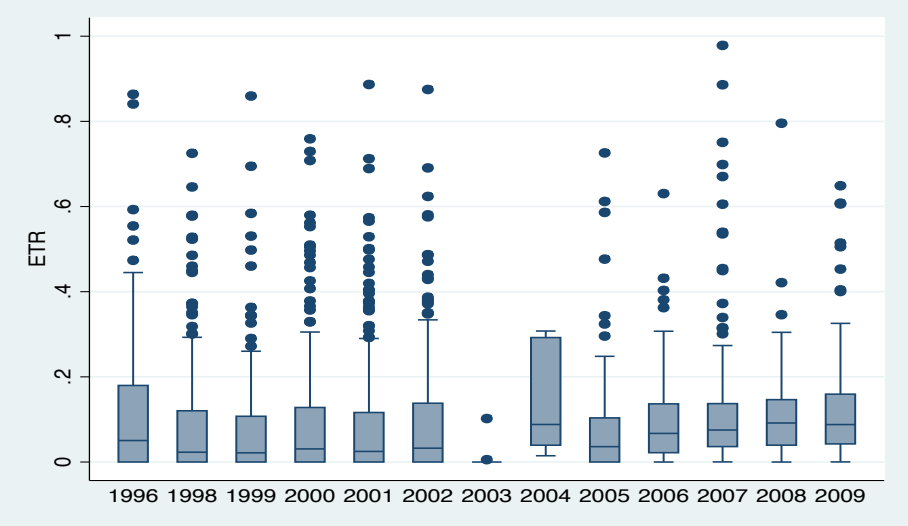
Note: The figure refer to the pooled sample of all firm-year observations.

Figure 5.5.2 shows the evolution in time of the ETR in the sample. It confirms again that the ETR is generally lower than the statutory rate in all years, although there are a few cases where the ETR is higher than the statutory rate and in a few rare cases substantially so. This may be explained with tax arrears or plain mistakes in the data. These cases however are only 115 observations out of about 3,300, therefore representing a relatively small minority of cases. A comparison of means revelas that these outliers (in terms of the ETR) have a higher mean value of sales and profits.

The most striking feature of the graph is the sharp drop and subsequent increase in the ETR in years 2003 and 2004. The drop in 2003, which corresponds to 2002/2003 due to the difference between the Ethiopian and Gregorian calendar, may be explained by the historical situation at the time. Indeed this period is marked by one of the most devastating droughts and famines in the history of Ethiopia, and surely the most important one in the period considered. One explanation might thus be that the government was

not able to collect taxes in this year because the drought emergency was taking up a lot of its administrative capacity. As far as 2004 is concerned, the calculation of the mean ETR for this year only relies on 7 observations. The small number of firms observed is due to a large number of missing observations in the profit tax variable in that year particularly, rather than to negative profits[22]. Given the choice to include only observations where tax data is non-missing (see section 5.4), the number of observations for this year is very low. The influence of the drop and subsequent increase in ETR in 2003 and 2004 is explicitly taken into account in section 5.8 by dropping those two years of data and by trying to impute zeroes instead of missing values to increase the number of observations in 2004. A further discussion of this issue is reported in appendix 5.C.

Figure 5.5.2: Evolution of ETR in time



ETRs and the core variables

Having described effective tax rates and their evolution in time, this section presents a descriptive analysis of their relation with the core variables in the model. To have a first idea of the correlation between variables, table 5.5.3 shows the correlation matrix for all the variables in the analysis. While this is useful for a first identification of pairwise correlations, also between explanatory variables, a multivariate analysis is required to identify partial effects. The table shows that the ETR is positively and significantly correlated with size, whether it is measured with employment or the value of sales, public and age. It is also negatively and significantly correlatd with capital intensity and invesment, with the

[22]Note that observations with negative profits are dropped as they would result in a negative ETR and this could indeed have been a reason for the low number of observations.

latter relation being largely expected. As far as the explanatory variables are concerned, the correlation matrix suggest that public firms are significantly bigger than private ones and generally older.

Table 5.5.3: Correlation matrix: ETR and core variables

	ETR	empl	sales	cap. int.	invest	public	age
ETR	1						
size (empl)	0.13	1					
size (sales)	0.09	0.86	1				
cap. int.	-0.11	0.04	0.25	1			
invest	-0.06	0.03	0.04	0.05	1		
public	0.18	0.59	0.50	-0.04	0.01	1	
age	0.17	0.47	0.36	-0.14	0.05	0.45	1

Taking a closer look on size, table 5.5.4 shows the ETR by quintiles calculated both using employment and deflated sales value. The quintiles are calculated on the pooled sample (upper panel of table 5.5.4) and on the last two years of data only (lower panel) to avoid picking up time effects[23]. The table confirms a linear positive relation between size and the ETR, with the latter increasing rather consistently across quintiles. It also shows that ETRs are higher in the last two years of data with respect to the pooled sample, pointing to an increased capacity of the state of extracting revenues from the manufacturing sector and/or to increased profitability of firms. In addition the graphs in appendix 5.D report the distribution of ETR by firm size over time.

Table 5.5.4: ETR by size quintiles

Size	1	2	3	4	5	tot
Pooled sample						
Employment	6.8	7.3	7.2	9.9	10.5	8.3
Sales	7.1	7.0	7.6	8.6	10.3	8.2
2008 - 2009						
Employment	8.5	10.4	11.3	11.8	13.3	11.1
Sales	8.7	10.8	9.5	12.5	13.9	11.1

Exploiting the time series properties of the dataset, it is possible to explore the mobility of firms across values of selected variables[24]. In particular tables 5.5.5 and 5.5.6

[23] It may be that firms are getting bigger in time on average and taking quintiles in the pooled sample may just capture observations for older years in the lower quintiles and for most recent ones in the higher quintiles.

[24] Transition matrices show the transition probabilities, i.e. the change in one categorical variable over

look respectively at the probability of transitioning between quintiles of size and between private/public ownership in any two consecutive years. Table 5.5.5 shows that firms do not move much across quintiles of size[25], with the majority of observations in the table lying in the diagonal, therefore indicating no change in size qiuntile. When firms do move they are most likely to do so in the next nearest quintile. Note that size can also vary within a quintile and this mobility is not captured in table 5.5.5. Mobility between private and public ownership is also limited, with only 2% of firms that are initially private switching to public and 12% switching in the opposite direction (see transition matrix in table 5.5.6).

Table 5.5.5: Transition matrix: 5 size quantiles

	1	2	3	4	5	Total
1	72.81	22.48	4.07	0.43	0.21	100
2	18.69	61.23	17.69	2.39	0.00	100
3	1.26	13.00	69.60	15.09	1.05	100
4	0.19	1.30	10.22	79.00	9.29	100
5	0.00	0.18	0.73	5.14	93.94	100
Total	29.84	7.63	20.63	21.9	20	100

Table 5.5.6: Transition matrix for public ownership

	Private	Public	Total
Private	1,775	35	1,810
	(98.07)	(1.93)	(100)
Public	87	633	720
	(12.08)	(87.92)	(100)
Total	1,862	668	2,530
	(73.60)	(26.40)	(100)

Finally it is worth noting that the average ETR in the years after the reform was 9.9%, higher than the pre-reform average of 7.7%. The dispersion of ETR however was relatively stable before and after the reform, in terms of standard deviation.

A descriptive analysis of negative profits

As noted in section 5.4.1, observations with negative profits are excluded from the sample as they would pose interpretation probelms in the econometric analysis. It is however useful to explore these observations in a descriptive manner to identify possible patterns

time.

[25]However, note that firm size may not change but quintile boundaries may be moved in differnt years.

that may determine selection problems (see section 5.8). Of all the firm-year observations for which there is enough information to calculate profits, 23% report a value equal or smaller than zero. This corresponds to 116 establishments and 19% of all firms observed. These are largely concentrated in Addis Ababa that is in fact over represented in this sub-sample of firms with zero or negative profits, with 60% of these firms based in the capital as opposed to 53% of all observations on profits. The positive relation between size and profits suggests that smaller firms are more likely to incur in losses and that therefore in the sample relatively larger firms are over-represented with respect to the whole population.

Perhaps not surprisingly, firms with negative or zero profit pay on average 16 times less taxes (in absolute value) than firms with positive income. While it is not straightforward why these firms still pay tax, this may be due to arrears in tax payments, delays in tax collection or adjustments in tax calculations.

Going back to the main sample, it is useful to identify the determinants of profits, as these relations would indirectly influence the ETR through its denominator. To this aim, appendix 5.E reports the results of auxiliary regressions of profits on the other explanatory variables. However the results from these regressions are to be interpreted only on a descriptive level as simple associations. The results show a positive relation of profits with all explanatory variables, although not so clearly for age.

5.6 Empirical framework

Panel data is characterized by the co-existence of a cross-sectional dimension, namely N units i, in this case firms, and a time series dimension, namely T time periods t. Its main advantage is that by observing units over time, it allows taking into account firm specific unobservable effects that may otherwise result in biased estimates. There are in particular three types of unobservables: individual varying but time invariant variables, such as managerial ability and corporate culture; time varying but individual invariant variables, such as particular events in the regulatory or institutional environment faced by firms; and both individual varying and time varying variables. The first two can be taken into account with panel data analysis, and namely with a fixed effects model (FEM) or a random effects model (REM).

Generally, a panel data model with fixed effects can be summarized as follows[26], where

[26]The discussion on available models for panel data draws largely on Baltagi (2005) and Wooldridge

$i = 1, \ldots, N$ denotes the cross sectional units and $t = 1, \ldots, T$ denotes the time dimension and β and x_{it} are vectors of respectively coefficients and variables.

$$y_{it} = \alpha + \beta x_{it} + u_{it} \tag{5.4}$$

where

$$u_{it} = \mu_i + \nu_{it} \tag{5.5}$$

In equation 5.4, the unobservable firm specific μ_i is captured in the error term along with the true error ν_{it}. This would result in biased and inconsistent OLS estimates of β if μ_i is also related to the explanatory variables (i.e. if $Corr(x_{it}, \mu_i) \neq 0$). Instead panel data models, by taking into account the heterogeneity between units, allow the identification of the effects of the observable variables, *given* the unit-specific unobservables.

In a FEM context, the firm specific effects can be eliminated by de-meaning[27]. Estimates thus obtained are called *within* estimates (β_{within}) as they exploit variations within the unit, over time. Note that this procedure eliminates all time invariant effects, both observed and unobserved. Therefore if the x vector contains a variable such as location or sector, that are not expected to vary in time, they would be cancelled along with the unobservables.

The model described so far is also called the 'one way error component model' and it takes into account only unobservables that are unit specific. The 'two way error component model'[28] takes into account also unobservables that are time specific but do not vary across firms (Baltagi, 2005). These may be for example effects related to the environment where individuals or firms operate, that are indeed potentially relevant. These time specific effects can be captured by time dummies.

In addition to the *within* variation, panel data also allows the estimation of a *between* estimator ($\beta_{between}$) that exploits only the variation between groups. This is implemented essentially by taking averages for each unit over time. While the *between* estimator looks at differences between firms, the *within* estimator explores variations within a firm over time. Since both variations are potentially intersting, both estimators are implemented in this exercise.

When all unobserved variables can be considered collectively as a significant random

(2009).

[27] This is what is done here. Two other approaches yield largely equivalent results: including $N - 1$ dummies for each firm (i.e. LSDV) or first differencing.

[28] In this case the error term would look as follows, where λ_t is the time specific effect: $u_{it} = \mu_i + \lambda_t + \nu_{it}$.

variable, a random effects model (REM) can be used. One of the main differeces between FEM and REM is that the latter requires all unobservables to be uncorrelated with the included explanatory variables in all time periods. This is a strong assumption and it should be evaluated carefully when choosing between the two models. The choice between FEM and REM should be based on the research question, on the characteristics of the data and on the plausibility of the assumption of independence of the unobservables from x.

In this case a FEM approach seems to be more appropriate for at least two related reasons. Firstly the expected unobservables are related to managerial ability and the firm's culture and reputation. While these variables can change in time, they can be expected to be largely time-invariant in a relatively short period like the one considered here. Note that while the panel spans over 14 years, the average number of years over which firms are observed in the sample is 4.4 (see section 5.4.1). Secondly, these unobservables are expected to be related to the x thus breaking the REM assumption. For example, it is reasonable to expect managerial ability to be positively related with size.

Notwithstanding the *a priori* preference for FEM, both models are estimated and the Hausman test is used to identify the most appropriate one. Essentially the test compares the estimates derived under REM and FEM, exploiting the fact that if the unobserved effects are related to the x then β_{GLS} is biased and inconsistent. The null is that the difference in coefficients is not systematic. Therefore the test can be interpreted in a simplistic manner as supporting adoption of the FEM if H_0 is rejected or of the REM if it cannot be rejected. It is important to note that the rejection of the null only implies that the REM is not consistent but not that the FEM is necessarily the correct model to use.

A final note is due on endogeneity. It is argued in section 5.3 that the theoretical relation between the explanatory variables and the ETR goes from the former to the latter. The identification of this causal relation lies in the difference between the tax system and the effective tax rate. While the former may have an effect on how firms behave, the latter is determined by the extent to which firms can and do exploit the tax preferences and legal loopholes set out in the tax system. While the tax system is the same for all firms, the ETR is firm-specific and it may also change in time for the same firm. However despite the theoretical framework, endogeneity may still be an issue[29]. The use of instrumental variables is limited by data availability. Moreover GMM methods are

[29]Some papers in the literature have looked at the effect of ETRs on size, recognising however the possibilty of reverse causality (Da Rin et al., 2010).

not particularly suitable due to the unbalanced nature of the panel data and the costliness of such methods in terms of observations, particularly when T is small.

5.7 Results

This section starts by considering a few models that only include the core variables and namely: size[30], capital intensity, investment, public ownership, reform, age (see section 5.3). This is the core model shown in equation 5.6, that is reported here again for convenience.

$$ETR = \alpha + \beta_1 SIZE + \beta_2 CAPINT + \beta_3 INVEST + \beta_4 PUBLIC + \\ + \beta_5 AGE + \beta_6 REFORM + \epsilon \quad (5.6)$$

The dependent variable is always the effective tax rate, calculated as discussed in section 5.3 and 5.4. The four econometric models outlined in section 5.6 and namely OLS, FEM, REM and BE, are estimated and the results are reported in table 5.7.1. Note that in the BE regression *reform* is excluded since this variable displays only variation in time and not across firms.

As far as size is concerned, the significant result using FEM suggests a positive, though small, effect of size. The variable is transformed in logs and the interpretation of its coefficient, taking the FEM as an example, would suggest a 0.009 percentage point increase in the ETR when size increases by 1%. The coefficient on capital intensity is always negative and mostly significant. An increase of 1 point in capital intensity (measured as fixed assets in millions per employee) is associated with a 3.5 percentage point decrease in the ETR in specification (2). Investment has the expected negative and significant sign, with 1 percentage point more investment (as a share of total assets) decreasing the ETR by 1.4 percentage points. This effect is in line with the commonly adopted policy objective of promoting investment through fiscal incentives. The public ownership dummy always displays a positive coefficient that is always significant except in the FEM specification. The lack of significance in the FEM may be due to the small degree of variation that *public* displays over time (see table 5.5.6 in section 5.5). The tax reform of 2002 seems to have had a positive and significant effect, increasing the effective tax rate by 2.1 to 3.7 percentage

[30] Note that throughout this section only the number of employees is used as a measure of size. However robustenss to this choice is checked by using the value of sales in section 5.8.

Table 5.7.1: Pooled OLS, FEM, REM and BE results

	(1) OLS	(2) FEM	(3) REM	(4) BE
size	-0.002	0.009*	-0.001	-0.001
	(-0.89)	(1.81)	(-0.29)	(-0.31)
cap int	-0.093***	-0.035	-0.080***	-0.088***
	(-5.20)	(-1.40)	(-4.13)	(-2.87)
invest	-0.013***	-0.014***	-0.013***	-0.013*
	(-4.28)	(-5.97)	(-4.60)	(-1.73)
public	0.041***	0.017	0.031***	0.025**
	(6.64)	(1.14)	(4.23)	(2.34)
reform	0.026***	0.037***	0.021***	
	(5.34)	(3.87)	(4.43)	
age	0.001***	-0.003**	0.001***	0.001***
	(4.54)	(-2.46)	(3.47)	(3.59)
Constant	0.069***	0.097***	0.066***	0.069***
	(11.08)	(3.10)	(8.64)	(7.93)
Observations	3287	3287	3287	3287
N_g		758	758	758
r2	0.06	0.02	0.06	0.06

Note: t statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

points, according to the different estimates. Remember that the reform decreased the statutory tax rate from 35% to 30% and it paved the way for increased efforts in tax enforcement. The positive coefficient may therefore suggest a behavior consistent with the Laffer curve or merely the increased effort in enforcement entailed in the reform, or a combination of both. The coefficient on age is significant in all specifications and mostly positive, with the exception of the FEM that estimates a negative effect. However note that in the FEM model, looking at within variations for a firm in time, the age variable is essentially a trend variable.

Two tests are available to identify the correct model, the results of which are reported in table 5.7.2. First, the F-test for the joint significance of the fixed effects compares the pooled OLS model with the LSDV model with firm dummies. This test rejects the null and therefore supports the significance of fixed effects. Second, the Hausman test supports the superiority of FEM to REM as the latter yields incosistent estimates.

Furthermore, table 5.7.2 reports the results of the autocorrelation and heteroskedasticity tests for the preferred FE model. The Wooldridge test for autocorrelation in panel data suggests that no autocorrelation is present in the data. The modified Wald statistic for groupwise heteroskedasticity (Greene, 2008) considers firms as groups and strongly rejects the null of homoskedasticity. Therefore clustered standard errors are reported in the result tables.

Table 5.7.2: Post-estimation tests

Test	H_0	Test statistic	P value
F test	H_0: all fixed effects are equal to zero	F(6,757) = 12.26	0.000
Hausman test	H_0: difference between FEM and REM is not systematic	chi2(6) = 20.09	0.003
Wooldridge test	H_0: no first-order autocorrelation	F(1, 326) = 0.103	0.748
Wald test	H_0: homoskedasticity	chi2 (758) = 8.8e+36	0.000

Note: Wooldridge and Wald test are performed on the FE model.

In conclusion, the model of choice is the fixed effect model. This choice is not only supported by the test statistics described above but also by the possibility of taking into account firm-specific effects that are unobserved but that are likely to affect the effective

tax rate. These may for example be the firm's culture and the quality of management, besides the factors explored in section 5.7.3 such as location and sector. The following discussion will therefore focus on the FEM and BE. In particular the latter allows taking into account the time invariant but observable variables, such as location and sector, that are necessarily excluded from the FEM.

5.7.1 FEM

Table 5.7.3 reports the results from the FEM, including the baseline specification already shown in table 5.7.1 and other estimated equations augmented with control variables and year dummies. The table also includes, at the bottom, a few statistics that are useful when commenting the results. In particular, both the number of firm-year observations and the number of firms (N_g) included in each regression are reported. Furthermore the table includes the three R-squared of the FEM model: *within* (r2), *between* (r2_b) and *overall* (r2_o). Finally the table reports the value of *rho*, which is the fraction of variance in the error term due to the fixed effects, and the F-statistic for the joint significance of the fixed effects. These statistics are explained and discussed in detail in section 5.7.2.

The first specification in table 5.7.3 reports the baseline equation estimated with a FEM, the results of which were already discussed previously. Specification (2) adds an interaction term between reform and size, which aims at capturing the extent to which tax reform tackles the possible inequalities emerging from the effect of size on ETR. The coefficient obtained is not significant, although it is jointly significant with *size* ($F(2, 757) = 7.50$, p-value = 0.0006). This suggests that reform may have had an effect on the relation between size and ETR, particularly further increasing the positive effect already observed on size. In other words, the positive coefficient on the interaction term suggests that after the reform the (positive) effect related to the politcal cost hypothesis is even stronger than the (negative) one implied in the political power hypothesis. According to this interpretation, the 2002 reform would have made it even harder for large firms to obtain fiscal benefits or to escape the tax net through evasion. However the very low t-statistic of the interaction term imposes caution in interpreting this result.

The next specification (3) adds year dummies to the baseline equation, that may be useful to capture special conditions in the environment faced by firms. The inclusion of year dummies however results in dropping the reform variable, as it essentially captures the same variation. The table does not report all coefficients for year dummies for the sake of simplicity and readability. However two of them are significant in all specifications and

Table 5.7.3: FE estimation results

	(1)	(2)	(3)	(4)	(5)
size	0.009*	0.009*	0.009*	0.006	0.006
	(1.81)	(1.79)	(1.74)	(0.87)	(0.84)
cap int	-0.035	-0.035	-0.050*	-0.062*	-0.064**
	(-1.40)	(-1.39)	(-1.96)	(-1.94)	(-2.09)
invest	-0.014***	-0.014***	-0.012***	-0.016***	-0.014***
	(-5.97)	(-5.99)	(-4.98)	(-4.83)	(-4.19)
public	0.017	0.017	0.025*	0.068***	0.070***
	(1.14)	(1.21)	(1.66)	(3.32)	(3.37)
reform	0.037***	0.030		0.025**	
	(3.87)	(1.20)		(1.99)	
age	-0.003**	-0.003**	0.002*	-0.000	0.003**
	(-2.46)	(-2.47)	(1.71)	(-0.19)	(2.17)
reform*size		0.002			
		(0.31)			
export				-0.033	-0.023
				(-0.58)	(-0.45)
growth				-0.004	-0.002
				(-0.93)	(-0.56)
owners				0.001	0.001
				(0.77)	(0.53)
Constant	0.097***	0.097***	0.029	0.052	0.010
	(3.10)	(3.11)	(1.01)	(1.26)	(0.28)
Years	no	no	yes	no	yes
Observations	3287	3287	3287	1938	1938
N_g	758	758	758	679	679
r2	0.02	0.02	0.08	0.03	0.07
r2_b	0.02	0.02	0.07	0.04	0.05
r2_o	0.00	0.00	0.08	0.03	0.04
F	11.78	10.21	23.14	5.90	7.85
rho	0.45	0.45	0.38	0.47	0.53

Note: t statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

in particular 2003 and 2005. The negative and significant coefficient on the former should not come as a surprise, as revenues dropped sharply in that year probably as a result of the famine emergency (see section 5.5). The negative coefficient on 2005 on the other hand may be explained by the elections that took place in that year, as the government may have decreased temporarily the fiscal burden in the pre-election period.

The results including the year dummies are largely in line with the previous two specifications (1 and 2). However the model now provides a better fit, with a within R-squared of 8%. While this value is still low, it indicates that the inclusion of time dummies increases considerably the explanatory power in these regressions. Moreover both capital intensity and public ownership are now significant, although at the 10% level, with the expected negative and positive signs respectively. The most remarkable change however is in the coefficient on age that now turns to positive and still significant. This change may be due to the fact that age in a FEM context essentially captures a trend rather than only age itself. When time dummies are included, and they have mostly negative signs, the coefficient on age turns to positive. It indicates that one more year in the age of a firm is associated with an ETR 0.2 percentage points higher. This positive result is consistent with the one on size, as the rationale for older and larger firms to face higher ETRs is based on visibility in both cases. Note that age and size are strongly and positively correlated in the sample, as shown in table 5.5.3.

Specifications (4) and (5), add three control variables that may influence the ETR respectively without and with time dummies. None of these controls is significant and their inclusion also results in a sharp drop in the number of available observations, as many firms do not report the necessary information. However their inclusion, and the resulting smaller sample, do not change the main findings on the core variables either in terms of sign or of magnitude. The negative sign on growth may be interpreted as a fiscal advantage that firms have when they grow more, perhaps because they have more bargaining power as national 'champions'. The share of export in total sales is also negative although not significant, indicating a fiscal advantage of exporters.

As far as the core variables are concerned, size is significant at the 10% level only when controls are not included. However the coefficient remains positive and of comparable magnitude in all specifications. This lack of strong significance of *size* may be due to its limited variability in time (see table 5.5.5), that therefore implies that its effect may partly be picked up as a fixed effect in a FEM context. It may also be the result of the coexisting counteracting effects of the political power hypothesis (negative) and the political

cost hypothesis (positive). The effect of capital intensity remains negative across specifications, although not always significant, with the coefficient being larger in magnitude when controls are added. The estimates of the effect of investment are largely consistent, being always negative, significant at the 1% level and of virtually the same magnitude in all specifications. *Public* is the dummy for public ownership that is also meant to capture political connections. This variable is significant only when year dummies and/or controls are added to the equation. The coefficient is consistent across specifications in that it is always positive, although both significance and magnitude vary. It indicates that publicly owned firms, far from having a fiscal advantage, face higher ETRs than privately owned ones. As noted previously (see table 5.5.6), the variable only varies little over time thus partly explaining its lack of significance in some FEM specifications[31].

Finally, the reform dummy is always significant and positive, except when the interaction term with size is included. However an F-test of joint significance of *reform* and its interaction with *size* shows that the two variables are significantly different from zero when considered jointly. These results suggests that reform succedded in increasing ETRs despite providing for a decrease in the statutory tax rate.

5.7.2 Goodness of fit and fixed effects

This section focuses on some of the statistics reported at the bottom of the results table 5.7.3, starting from the three R-squared. In a FEM context, these are calculated on the basis of the empirical model discussed in section 5.6.

In particular the R-squared measures the (squared) correlation between the predicted values from the model and the actual values of the dependent variable. It therefore represents the fraction of the variation in the dependent variable that is explained by the equation. Since the fixed effects (FE) are included in the error term, their explanatory power is not taken into account in the calculation of the R-squared. The R-squared *within* is therefore the portion of the variation of y that is explained by the model, *excluding* the fixed effects. The exclusion of fixed effects from the computation of the R-squared is one reason why the R-squared can be low in FE models. The R-squared *between* would thus be interpreted as the fraction of the variation between units that is explained by the variables in the model, excluding fixed effects. Therefore if FE have a high explanatory

[31] As *public* is correlated with age and size, with older and bigger firms more likely to be in public ownership, a further check can be done by dropping these variables to check whether it becomes then significant. This is not the case, through the coefficient remains positive. For the sake of simplicity, these results are not reported as they would add very little information to the table.

power for the variation across units, the R-squared *between* will be very low.

In this case, the *within* R-squared ranges from about 2% to 8%. The explanation relies partly in the exclusion of the fixed effects. This is clear when comparing these figures with the R-squared obtained when estimating the core model with LSDV, which is 40%. LSDV estimation of the core model is equivalent to specification 1 in table 5.7.3 but its R-squared takes into account the explanatory power of the fixed effects[32].

Furthermore, *rho* measures the fraction of the variance of the whole error term ($\mu_i + \nu_{it}$) that is explained by the fixed effects components (μ_i). It therefore gives an indication of the explanatory power of the fixed effects. The value of *rho* indicates that the fixed effects explain about half of the variance of the whole error in the FEM, thus confirming once again their importance in the equation.

Since the F statistic and the *rho* confirm the importance of the fixed effects, it is useful to explore them further. A first indication can be obtained by plotting them as in the figure reported in appeddix 5.F that also includes a normal distribution for reference. Moreover it is possible to bring them on the LHS and regress them on the other explanatory variables. Their predicted values are obtained from the FEM core model with year dummies. As they do not vary in time but only across firms, the between estimator is used. The results are reported in appendix 5.F. The fixed effects appear to be consistently related negatively with size and age while other variables do not display significant coefficients, except for public (positive) but only when region dummies are included.

5.7.3 Between estimator

The analysis based on FEM does not include variables such as foreign initial capital, location and sector dummies because they are fixed in time and they would therefore be dropped in the FE model. They can however be included when using a between estimator, that exploits the variation between cross-sectional units rather than within them. One of the advantages of BE models is that, by taking average values for each firm, they smooth out spikes in the data and they also reduce the effect of the possible lags discussed in appendix 5.C. Since the sample does not provide enough subsequent observations to sensibly use period averages, as could be done with longer time series, only time averages for the whole period are considered in the BE model.

Tables 5.7.4 and 5.7.5 report respectively the results of the baseline model augmented

[32] In the LSDV model the fixed effects are included as a set of dummies amongst the regressors, rather as part of the error term as in the standard FEM procedure performed by STATA.

with, alternatively, region and sector dummies[33]. The dummies are included alternatively to avoid the overspecification of the model. In addition the same control variables discussed in section 5.7.1 are also included here.

Table 5.7.4: BE results with regions

	(1)	(2)	(3)	(4)
size	-0.001	-0.012***	-0.004	-0.005**
	(-0.31)	(-2.77)	(-1.51)	(-2.03)
cap int	-0.088***	-0.149***	-0.057**	-0.082***
	(-2.87)	(-2.97)	(-2.32)	(-2.76)
invest	-0.013*	-0.005	-0.012*	-0.017**
	(-1.73)	(-0.72)	(-1.72)	(-2.36)
public	0.025**	0.108***	0.038***	0.041***
	(2.34)	(6.00)	(3.23)	(3.90)
age	0.001***	0.000	0.001**	0.001***
	(3.59)	(0.06)	(2.19)	(3.10)
foreign capital		0.016		
		(0.82)		
export		0.009	-0.039	
		(0.21)	(-1.40)	
growth		-0.003	0.002	
		(-0.63)	(0.39)	
owners		-0.002		
		(-0.95)		
Constant	0.069***	0.119***	0.094***	0.098***
	(7.93)	(7.03)	(8.80)	(10.18)
Regions	no	yes	yes	yes
Observations	3287	655	2625	3287
N_g	758	420	733	758
r2	0.06	0.18	0.10	0.13

Note: t statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

[33]The tables including the coefficients for region and sector dummies are reported in appendix 5.G.

Table 5.7.5: BE results with sector dummies

	(1)	(2)	(3)	(4)
size	-0.001	-0.007	0.000	-0.002
	(-0.31)	(-1.60)	(0.09)	(-0.58)
cap int	-0.088***	-0.152***	-0.053**	-0.071**
	(-2.87)	(-2.88)	(-2.03)	(-2.23)
invest	-0.013*	-0.004	-0.008	-0.012*
	(-1.73)	(-0.51)	(-1.12)	(-1.66)
public	0.025**	0.095***	0.026**	0.031***
	(2.34)	(5.29)	(2.22)	(2.94)
age	0.001***	0.000	0.001**	0.001***
	(3.59)	(0.16)	(2.47)	(3.52)
foreign capital		0.018		
		(0.90)		
export		0.003	-0.037	
		(0.06)	(-1.31)	
growth		-0.005	0.000	
		(-0.98)	(0.09)	
owners		-0.002		
		(-0.98)		
Constant	0.069***	0.087***	0.059***	0.065***
	(7.93)	(4.58)	(5.01)	(6.08)
Sectors	no	yes	yes	yes
Observations	3287	655	2625	3287
N_g	758	420	733	758
r2	0.06	0.15	0.06	0.11

Note: t statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Starting from size, it is useful to consider how the coefficient behaves once the dummies are included, both in table 5.7.4 and 5.7.5. This variable has a small and negative coefficient, mostly not significant. The lack of significance indicates that the effect of size may occur mostly within firms (as in the FEM model) rather than between firms. The negative coefficient is only significant when region dummies are included, although not in all specifications. While the result needs to be taken with caution due to the lack of significance in most specifications, it is not necessarily at odds with the FEM result. It indicates that generally larger firms can obtain lower ETR (though this negative effect is largely non-significant). However within the life of a firm, and in the small variability in terms of size, as firms grow bigger they are more visible and therefore face a higher ETR. Since the variability in size is not very high, it is likely that over the sample relatively big firms remain bigger and smaller firms remain smaller as they mostly move to adjacent quintiles (see table 5.5.5).

Capital intensity and investment retain their negative and significant coefficients, particularly in specification (4) of both tables where the maximum number of observations is used. *Public* is now always significant and the positive sign found in table 5.7.3 is confirmed. The magnitude of the coefficient is also similar to the one obtained with the FEM, suggesting that public ownership is associated with a 3.1 to 4.1 percentage points higher ETR (in specification 4 of tables 5.7.4 and 5.7.5). The coefficient on *age* is positive and mostly significant, consistently with the FEM results with year dummies. This confirms the fact that age in a FEM context may essentially capture a trend rather than age in itself, if time is not controlled for with year dummies. However the coefficient remains small, with an additional year in the firm's age corresponding to a 0.1 percentage point increase in the ETR. This positive coefficient fails to support the idea that older and more established firms are more able to lobby the government and therefore to obtain lower ETR. On the contrary older firms experience higher ETR, perhaps because of higher visbility.

Specification (2) in both table 5.7.4 and 5.7.5 includes all the additional control variables also discussed in section 5.7.1 as well as initial foreign capital. The results show that all these controls are not significant. Moreover the sample size decreases dramatically by including them, and this is particularly due to *owners* and *foreign capital*. These two variables are therefore dropped in (3), thus increasing the sample size but still not finding significance for either *growth* or *export* in either of the two tables. Remember that controls are not found to be significant in the FE model either. Finally, specification (4) includes only the core variables and the region dummies in table 5.7.4 or the sector dummies in

table 5.7.5.

As far as regions are concerned, the dummy for Addis Ababa is excluded and therefore all the results are to be interpreted as deviations from this benchmark[34]. Regional dummies mostly have negative coefficients (results reported in appendix 5.G), suggesting that Addis Ababa faces a higher ETR than other more remote regions. This is probably due ot the higher visibility and accessibility of firms in the capital, as discussed also in section 5.5.2. Afar and Tigray are exceptions in that firms there face a higher ETR, respectively by 5 and 2.4 percentage points (results reported in appendix 5.G). However these two positive coefficients are not significant. It is important to note that firms are mostly concentrated in Addis Ababa and Oromia (see section 5.5) and thus other regions may only have a few observations. This is the case for Gambela, that has a large negative coefficient which however is driven by only 6 observations in the sample. The negative effect is not surprising however, given that firms operating in remote regions, such as Gambela, can benefit from fiscal incentives.

As far as sectors are concerned, the dummies included refer to the top manufacturing sectors in Ethiopia, that together account for over 50% of the sample (also see section 5.5)[35]. This implies that smaller sectors are omitted and thus the coefficients can be interpreted against this group of minor sectors. Significant coefficients can be found only for *bakery* and *media*, with firms in these two sectors facing higher ETRs by respectively 4.3. and 3.4 percentage points (results reported in appendix 5.G). Note that the sectors considered here are based on the 4-digit level of the ISIC code and that only manufacturing firms are considered, while other studies in the literature include the industrial sector as a whole where manufacturing altogether is one of the sub-sectors (Derashid and Zhang, 2003).

5.7.4 Results on tax payments

This section turns the focus from the ETR to tax payments, therefore only considering the numerator of the ETR. These are essentially the amount of tax that firms pay and they represent, when aggregated, the tax take. The exercise on tax payments follows directly from the previous sections and it is based on a log transformation of the depen-

[34]Note that Beneshangul is also omitted because there are no observations from this region. This should be no surprise as the region is remote, not easily accessible and mostly focussed on agriculture.

[35]The sectors included in the BE regression represent 53,83% of observations in the pooled sample and they are: plastic, furniture, print, footwear, flour, bakery, cement.

dent variable[36]. This allows bringing *profits* to the RHS of the equation with the other explanatory variables and to assess its impact on tax payments. Note that profits could not be included in the core model because of its arithmetic negative correlation with the dependent variable.

Table 5.7.6 reports the results for all different models using the log transformation. The dependent variable is always the log of business profit tax payment and *profits* in the RHS is transformed in logs. Model specification is checked, as before, using the F test that confirms joint significance of the fixed effects and the Hausman test that confirms the superiority of FEM with respect to REM (see rows 1 and 2 in table 5.7.7). Heteroskedasticity and autocorrelation are checked for the preferred FEM model, and the results are reported in table 5.7.7. The first test (row 3 in table 5.7.7) confirms the presence of cluster-level heteroskedasticity in the FEM model and therefore clustered errors are used in column (2). The Wooldridge test can only reject the null at the 10% level but not at the 5% level. Therefore specification (3) reports a FE model where first order autoregression is allowed for. Column (5) reports results obtained using the between estimator.

Using the FEM and BE specification, table 5.7.8 explores in more detail the effect of profit by including its squared value and its lag. Specification (1) shows that the lag is positive and significant. The surprising result in column (1) is the negative and significant coefficient on reform, which so far was always found to have a positive and significant effect. Specification (2) checks whether reform picks up an income effect by including an interaction term between the two variables. Indeed the interaction is negative and significant while *reform* now turns positive although not significant. The two variables however are jointly significant with and F-test statistic $F(2, 521) = 6.96$ and a p-value of 0.001. This may suggest that the negative effect of *reform* in column 1 is probably due to an income effect after 2002. In particular, the interaction term indicates that after the reform, the effect of an increase profit is still to increase tax expenditure but not by as much as it did before the reform. Reform in itself instead now seems to have a positive effect on tax payments.

Furthermore specification (3) checks for non-linearities in the effect of profit by including its squared value. Its coefficient is indeed significant and positive in all subsequent specifications. It is noteworthy that in the FEM specification in column (3) its inclusion makes the sign on profit become negative though non-significant, although it is still jointly

[36]The ETR is transformed in logs as follows, where *tax* is short for tax payment: $log(ETR) = log(\frac{tax}{income}) = ln(tax) - ln(income)$

Table 5.7.6: Tax payments: OLS, FEM, REM and BE results

	(1) OLS	(2) FEM	(3) FEM-AR	(4) REM	(5) BE
profit	0.798***	0.604***	0.619***	0.699***	0.759***
	(38.06)	(13.54)	(21.12)	(31.32)	(21.74)
size	0.289***	0.329***	0.200**	0.388***	0.299***
	(8.14)	(4.38)	(2.45)	(9.81)	(4.91)
cap int	-0.385	-0.329	0.233	0.149	0.741
	(-1.24)	(-0.88)	(0.45)	(0.46)	(1.28)
invest	-0.248***	-0.160***	-0.132***	-0.206***	-0.244**
	(-6.21)	(-4.11)	(-3.21)	(-5.67)	(-2.55)
public	0.749***	0.535***	0.393***	0.612***	0.651***
	(9.23)	(3.64)	(3.15)	(6.53)	(4.19)
reform	0.152**	-0.159	0.140	0.135**	
	(2.53)	(-1.24)	(1.02)	(2.33)	
age	0.005***	0.054***	0.039***	0.009***	0.010***
	(2.84)	(3.68)	(3.27)	(3.58)	(3.25)
Constant	-1.340***	0.256	0.966***	-0.561***	-1.046***
	(-7.22)	(0.39)	(7.30)	(-2.65)	(-3.53)
Observations	2228	2228	1563	2228	2228
N_g		665	524	665	665
r2	0.84	0.34	0.79	0.83	0.85

Note: t statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5.7.7: Post-estimation tests

Test	H_0	Test statistic	P value
F test	H_0: all fixed effects are equal to zero	F(7,664) = 51.73	0.000
Hausman test	H_0: difference between FEM and REM is not systematic	chi2(7) = 40.61	0.000
Wald test	H_0: homoskedasticity	chi2 (665) = 2.1e+34	0.000
Wooldridge test	H_0: no first-order autocorrelation	F(1, 200) = 2.793	0.0962

Note: Wooldridge and Wald test are performed on the FE model.

significant when considered with its squared value ($F(2, 664) = 102.87, p-value = 0.000$). The combination of a negative coefficient on profit and a positive one on profit squared

implies a non-linear relation between profit and tax payments, and particularly a U-shaped one. In other words, as firms move to higher profit levels, they first face decreasing tax payments and then increasing ones. Moreover the results suggest that this relationship exists only within firms and not across firms. Columns 4 to 6 show that in the latter case instead as profit increases, tax payments increase exponentially.

Note that, considering the flat statutory tax rate which is applied in Ethiopia, a 1% increase in profit should result in a ($1\% \times 35\%$) increase in tax payments at all levels of income. Instead the results suggest the presence of tax preferences at low levels of profit that fade away at higher levels. Moreover they suggest that generally when firms have high profits, a further increase makes tax payments increase exponentially.

Finally sector and region dummies are not included in the table for the sake of clarity. As far as the former is concerned, significant and negative coefficients are found for *furniture* and *concrete*. As far as regions are concerned, the coefficients are all negative and mostly significant, except for Tigray that have a positive but non-significant coefficient. This confirms that firms in Addis, the excluded category, face generally higher tax payments.

5.7.5 Exploring the effect of negative profit

Finally this section takes into account the effect of negative profits, that is losses that firms may suffer in one or more year. Remember from section 5.4.1 that only observations where profit is positive are included in the sample. However losses may be a determinant of ETRs and thus they should be included in the equation, as suggested by Wang (1991) and Gupta and Newberry (1997). The *loss* dummy described in section 5.4 is therefore included in a BE model, as it varies across firms but not in time. The dummy should capture the presence of loss carryforwards, discussed in section 5.4 and 5.5. Appendix 5.H reports results of different specifications estimated with BE and including *loss* along with other control variables and dummies. The introduction of the *loss* variable does not change the coefficients of the baseline specification. Moreover the variable has a consistently negative coefficient, though not significant, indicating that firms that incur losses face lower ETR. This result is largely expected, also due to the possibility of carrying forward losses as stated in the Ethiopian tax law (see section 5.5). However the *loss* variable is never significant in any of the specifications, thus suggesting that its inclusion may not be necessary.

Table 5.7.8: Tax payments: results including profit squared, lagged and dummies

	(1) FEM	(2) FEM	(3) FEM	(4) BE	(5) BE	(6) BE
profit	0.637***	0.655***	-0.202	0.334**	0.208	0.277
	(11.34)	(11.54)	(-0.95)	(1.97)	(1.25)	(1.59)
profit lag	0.169***	0.166***				
	(3.80)	(3.71)				
profit sq.			0.031***	0.017**	0.022***	0.019***
			(3.93)	(2.56)	(3.44)	(2.81)
size	0.125	0.127	0.324***	0.267***	0.182***	0.227***
	(1.13)	(1.15)	(4.36)	(4.32)	(2.94)	(3.62)
cap int	-1.066	-0.990	-0.545	0.502	0.205	0.470
	(-1.11)	(-1.01)	(-1.32)	(0.86)	(0.36)	(0.77)
invest	-0.133***	-0.142***	-0.163***	-0.232**	-0.194**	-0.228**
	(-3.26)	(-3.46)	(-4.11)	(-2.44)	(-2.06)	(-2.40)
public	0.484***	0.448***	0.558***	0.618***	0.799***	0.667***
	(2.99)	(2.71)	(3.88)	(3.99)	(5.19)	(4.26)
reform	-0.502***	0.661	-0.167			
	(-2.72)	(1.14)	(-1.31)			
reform*profit		-0.078**				
		(-2.21)				
age	0.098***	0.103***	0.048***	0.010***	0.008***	0.010***
	(3.75)	(4.01)	(3.36)	(3.30)	(2.68)	(3.33)
Constant	-2.393**	-2.706**	5.448***	1.665	2.804**	2.213*
	(-2.24)	(-2.54)	(3.66)	(1.52)	(2.58)	(1.95)
Region dummies	no	no	no	no	yes	no
Sector dummies	no	no	no	no	no	yes
Observations	1414	1414	2228	2228	2228	2228
N_g	522	522	665	665	665	665
r2	0.36	0.36	0.35	0.85	0.86	0.85

Note: t statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.8 Robustness

5.8.1 Influence of 2003 and alternative ETR measure

As noted in section 5.5, the ETR in Ethiopia is affected by the famine as it drops dramatically in 2003 to increase sharply the following year. To check whether the main results are sensitive to these spikes, the two years 2003 and 2004 are dropped and the model re-estimated. Results from selected FEM and BE specifications are reported in table 5.I.1 of appendix 5.I. All results are essentially confirmed thus suggesting that the spikes corresponding to the famine do not determine them. While the results are generally confirmed in magnitude, sign and significance, a note may be useful on reform, size and age. Firstly once the two years of famine are dropped, the reform dummy becomes negative and significant at the 10% level in the baseline FEM specification. Therefore this result does not seem to be robust, indicating that the reform dummy may be picking up the effect of other events (most notably the famine) occurring in the same years. Second, the positive and significant result on size is confirmed in the FEM specification, and the coefficient is slightly larger now. In addition a positive, though largely insignificant, result is also found in the BE model except in the specification where region dummies are included. This suggests that the negative effect of size previously found in the BE specifications is not robust and indeed it was largely non-significant in the main results. Thirdly the results are indicative as regards the 'age puzzle' whereby age changed sign in the FE and BE results. In particular they show that the negative coefficient found in the previous FEM results is not robust to dropping the years of famine, as its coefficient is instead confirmed positive and significant as in other specifications (BE results in tables 5.7.4 and 5.7.5, results on tax payments in tables 5.7.6 and 5.7.8, and FEM results with year dummies in table 5.7.3).

Appendix 5.I also includes two additional tables. The first one (table 5.I.5) re-estimates the equation on a sample where zeroes were imputed for the tax variable when it is missing but all other variables are non-missing. This increased the sample by 655 observations, particularly in those years with more missing tax observations. The results are generally robust and size is positive and significant at the 5% level in all FEM specifications. However reform again does not appear to be robust. Secondy table 5.I.6 tackles the possible concern of a lag in the data, discussed in appendix 5.C, by replacing all variables except tax with their lags. The results are largely non significant, therefore suggesting that no relation exists between tax and the lagged explanatory variables. This supports the idea that a lag does not occur in the data, as argued in appendix 5.C.

5.8.2 The use of sales as a measure of size

As mentioned in section 5.4, size can be measured either in terms of employment or sales. While the former measure is adopted throughout the analysis, this section tests for the robustness of that choice by replicating the results using the values of sales instead of employment. As noted before, *sales* may capture the exogenous effect of inflation together with the actual size. This problem cannot be entirely accounted for, as different sectors experience different price dynamics and are more or less influenced by the national price shocks. However it is possible to partly correct for the effect of inflation by deflating the *sales* variable using the GDP deflator calculated on the aggregated national data on the large and medium manufacturing sector. This data is provided by the Ministry of Finance and Economic Development (MoFED) from 1997, thus excluding the first year of the Ethiopian dataset. This explains why the sample size is slightly smaller than in the previous analysis.

The FEM and BE models are re-estimated and the results are reported in appendix 5.I. The results of the previous analysis are largely confirmed, thus supporting their robustness to changes in the measure of size. As far as sales are concerned, the variable is mostly non-significant. The signs and magnitudes previously found for size however are largely confirmed, particularly a positive coefficient in the FEM and a negative one in the BE. The only significant result is in the BE model when regional dummies are included, consistently with the main results. The results on all other variables are esentially confirmed and in the case of reform, investment, age and all the sets of dummies they are virtually the same.

5.8.3 Selection problems

An analysis of ETRs necessarily includes only firms that do report tax information, particularly profit tax. First of all, it is useful to note that the firms included in the sample represent 95% of the total reported profit tax take in the survey and they therefore account for the bulk of the fiscal contribution of the manufacturing sector[37]. However there remains a natural question about the possible selection bias: are firms that omit the tax information systematically different from those who do report it?

A common way to deal with sample selection is the Heckman procedure. This procedure can be used in cases where the dependent variable is observed only if a criteria defined in terms of some random variable Z is met. However an instrument is required to identify

[37]This is true as far as the tax take reported in the survey is concerned.

the selection equation, which should both be a good predictor of selection and have no association with the outcome variable in the unrestricted population, after adjustment for other predictors of Y. In this case unfortunately such an instrument is not available and it is therefore not possible to correct for selection using the Heckman procedure.

However a simple and intuitive approach can offer some indications on selection: testing the equality of means in the explanatory variables in the sample and in the whole population. This can be done by using the explanatory variables that are available for firms that do not report tax information. Thus, two samples are compared: the one used in the ETR analysis, that includes the tax variable, and that of firms that report all variables but profit tax. They are named respectively sample 1, i.e. the sample used in this work, and 2, i.e. the observations that are excluded from the analysis. A t-test can then be used to test the null of the difference between the mean of specific variables in samples 1 and 2 to be zero. This test is performed for each of the core variables, except *reform*.

The tests reveal that for most variables the means are statistically different between the two samples. In particular, firms included in the ETR analysis are bigger, both in terms of sales and employment, less capital intensive, more likely to be public and older. However there seem to be no statistically significant difference in terms of investment share.

Note that these differences may be due to the fact that observations with negative profits are excluded, rather than to whether firms report or not tax information. It is possible to get indications regarding the source of selection by repeating all tests on samples defined on the basis of the availability of tax information rather than the ETR[38]. This may not be directly useful as regards the selection problem in the ETR analysis but it may give indications as to where selection comes from, namely from the profit or tax variables that compose the ETR. In this case the difference in means is still statistically significant for *capint*, *public* and *age*. However in the case of size there seem not to be a significant difference between the two samples, at least when employment is used as a measure of size[39]. This may suggest that the result found before, of firms in the used sample being bigger, is driven by the fact that observations with negative profit are excluded. Finally, now also the difference in investment is statistically significant, with firms reporting tax information investing less than others.

[38]Note that to obatain the ETR not only tax information needs to be available but also a positive profit value.

[39]Note however that when *sales* is used as a measure of size, the t-test shows that firms that report tax information are smaller than those do not, and this difference is statistically significant.

The t-tests therefore show that firms in the sample are generally bigger than those in the whole population, as well as being older and more likely to be public. In fact the three variables are related as shown in table 5.5.3. First of all this means that the results may only be applicable to the upper end of the population of large and medium enterprisees that are considered. Bigger firms may be selected into the sample simply because they complete questionnaires more fully. This may be because their larger resources, in terms of staff, organization and managerial systems, allow them to reply to questionnaires at a lower cost. Indeed bigger firms are more likely to have information readily available and dedicated departments for administrative issues that can provide detailed answers to the enumerators. Moreover, as they are more visible, bigger firms may generally find it harder to hide tax information to authorities and thus they would benefit less from not releasing information to enumerators. Remember that the Central Statistical Agency, which collects this data, is a governmental organization.

Another problem related to selection is attrition, as the panel used here is very unbalanced. Indeed attrition rates are high in the dataset and they may create a problem if attrition is non-random, similarly to the discussion above on selection. The LMMIS datase presents high levels of entry and exit in each year, which are due to actual movements into and out of business, as well as to possible issues with the quality of data collection. To address this issue in the calculation of attrition rates, I use 4-years intervals: from 1996 to 2001 (5 years), from 2002 to 2005 (4 years), and from 2006 to 2009 (4 years). I thus define attrition as the situation where a firm is observed in any year of the first period, but in none of the second period[40]. Between the first and the second period attrition occurs in 47% of the sample, while 53% of firms are observed in both periods. Between the second and the third period, the attrition rates is 26%, with 74% of firms being observed in both periods. The substantial drop in attrition in the most recent part of the sample may be due to both better economic conditions in Ethiopia and to improved data quality. As in the case of selection, attrition is only problematic if it is non-random. Following the previous discussion on selection, I adopt a simple and intuitive approach to test whether firms that exit the sample are systematically different from those who stay in the period before exit, when both groups are observed. Indeed a battery of simple t-tests on the difference in means between the two groups reveal that firms that exit are smaller, both in terms of sales and number of employees, and less profitable, than those that survive.

[40] More specifically, existance is defined as the availability of information (i.e. non-missing) on either the value of sales or the number of employees in that year.

The tests therefore suggest that attrition may cause bias in favour of larger and more profitable firms, as in the case of selection discussed before. There are potentially a number of techniques that can be used for correction for attrition, such as inverse probability weights. However this technique to correct for attrition requires the identification of an instrument that determines attrition but not the outcome variable, similarly to the Heckman procedure. Such variable is not available in this case, therefore making this type of correction not implementable. Imputation procedures are another option to address the issue of missing data. However they present several challenges (see, for example, Cameron and Trivedi (2005)) and they are beyond the scope of this thesis.

5.8.4 Change in ETR threshold

It is sometimes recommended (Omer et al., 1990) to test the robustness of results to different ETR measures. While this cannot be done with the Ethiopian data, it is however possible to check for robustness to different ETR thresholds. The choice adopted here, as explained in section 5.4.1, is to drop all observations in which the ETR is larger than one. This is standard in the literature and it is also intuitively sensible. However there may be instances in which the ETR is larger than 1 and indeed Kim and Limpaphayom (1998) use a threshold of 2 instead. Moreover Derashid and Zhang (2003) explain that in the process of consolidation between firms, profits and losses of subsidiaries are combined but a tax liability may still arise on the profits. Zimmerman (1983) explains the possibility of an ETR larger than one with timing issues, in the instance that an asset sold in one year at gain is only recognised for tax purposes in the following year thus resulting in a change in the numerator but not in the denominator. Even considering these cases however an ETR larger than 2 can reasonably be considered unrealistic and therefore be attributed to a mistake in the data.

The robustness of the results to changes in the upper ETR threshold is therefore checked by including in the sample also 26 observations with ETR larger than 1 but smaller than 2. The results are reported in table 5.I.7 of appendix 5.I. In addition table 5.I.8 (appendix 5.I) implements an alternative option, namely including observations with ETR larger than one but setting their value to 1. The main results are generally confirmed, although significance and magnitude do change in some specifications. This robustness check broadly suggests that the results are robust to changes in the ETR threshold, as all variables generally retain their sign and a magnitude comparable with previous results.

5.9 Summary of results: main findings

This chapter provides evidence on effective tax rates in Ethiopia, a country where tax preferences are widely used to promote investment and equitable regional development. In addition to these policy objectives, the chapter aims at identifying the effect of lobbying and political connections on the ETR. A few exercises are carried out in sections 5.7 and 5.8 which add to the descriptive analysis of section 5.5. It is therefore useful at this stage to summarize all the findings and to identify the main trends emerging from the analysis.

First of all, it is shown in section 5.5 that ETRs in Ethiopia are indeed very low, with a substantial proportion of firms paying less than 5% of their profit in tax. This confirms the idea that in Africa, and specifically in Ethiopia, tax preferences are widely used to reduce the tax burden on firms well below the statutory tax rate. In terms of tax revenue mobilisation, this may imply that not all the revenue potential of the manufacturing sector is tapped. Some of the sources of tax preferences are identified in section 5.7 and particularly the promotion of investment and regional development. Investment is found to have a negative and mostly significant coefficient across all specifications. Moreover firms operating in disadvantaged regions such as Gambela and S.N.N.P.R.[41] are able to obtain lower ETRs and this is indeed enshrined in tax regulations to promote equitable regional development. In addition a consistently negative and mostly significant result is found for capital intensity. This may capture the effect of leverage, as discussed in section 5.4, to the extent that more capital intensive firms can access credit more easily thanks to the availability of a collateral.

While it is possible to identify some sources of tax preferences that are indeed expected as they are part of the tax code, this exercise aims at exploring also the less official dynamics that may make some firms pay less thanks to lobbying, corruption or tax evasion. While these elements are not easily pinned down in a precise manner, this analysis allows nonetheless the identification of some aspects of it.

Firstly by including *size* it is possible to test whether larger firms are able to better lobby the government and obtain lower ETRs (political power hypothesis) or if, instead, they are easier preys of fiscal rules because of their higher visibility (political cost hypothesis). The results on size are rather weak and sometimes contradictory. This may be due to the offsetting effects that size may capture in a reduced form model (see section 5.3), and particularly the counteracting effects of the political power and the political

[41] Southern Nations, Nationalities, and Peoples' Region.

cost hypotheses. While FEM estimation yields mostly a positive coefficient on size, some specifications of the BE model yield negative ones that however are mostly not significant (except when regional dummies are included). Moreover these negative results are not robust to dropping the years of famine (see table 5.I.1 in the appendix).

The contradiction between the FEM and the BE results may be plausible however. FEM results suggest that increasing size in the life of a firm does not allow it to obtain lower ETRs, in fact the opposite as it may make it more visible and thus increase its ETR. Nevertheless it may still be true that firms that are bigger on average can have a small benefit in terms of ETR, as suggested by the BE model, particularly once regional differences are accounted for[42]. Indeed table 5.5.5 shows that the majority of firms stay in the same size quintile or move to the bordering one. It is therefore plausible that smaller firms remain relatively smaller even when they grow in size, while larger firms remain relatively bigger despite changes in size. This limited mobility across size quintiles may help reconcile the different results of FEM and BE models that indeed to capture different aspects of the question.

Therefore, the evidence on size does not provide much support for the political power hypothesis. Even considering the negative coefficient in the BE model, the effect is very small and largely non-significant. Size is instead found to have a more consistently positive *within* effect in FEM specifications (see tables 5.7.3, 5.7.6 and 5.I.1) thus offering more support for the political cost hypothesis. Moreover the positive coefficient is strengthened in magnitude and significance when the two years of famine are dropped. Furthermore the political cost hypothesis is supported also by the results on age, that are consistently positive once time effects are taken into account (see table 5.7.3) or the years of famine dropped (see 5.I.1 in appendix). This essentially answers the first of the three research questions asked at the end of section 5.3.

In terms of interpretation, a positive or non-significant coefficient means that larger firms face a higher ETR through increased visibility or that size does not matter in determining the ETR. In other words the government is not being lobbied, or not effectively so, by large firms to obtain fiscal benefits. Kim and Limpaphayom (1998) suggest that this situation may occur particularly when the power balance between the public and the private sector tends more towards the former as the government is able to maintain its

[42]However the fact that this negative coefficient is largely insignificant without region dummies makes it rather unreliable, also considering that it is actually positive though not significant in two of the BE specifications where the two years of famine are dropped (table 5.I.1).

power and hold big corporations accountable rather than being influenced by them. This may be the case in advanced economies also thanks to the activity of civil society organizations, such as Citizens for Tax Justice in the US. However similar organizations are rare in developing countries. A positive or insignificant relation may be plausible in the case of Ethiopia given its tradition of socialism and strong statehood. In this context, the balance of power between public and private is surely leaning more towards the former.

Finally note that only the manufacturing sector is considered, while the political cost and political power hypotheses may be more relevant for other sectors such as finance, construction and utilities (Wilkie and Limberg, 1990)[43].

Secondly the inclusion of public ownership aims at capturing the effect of political connections on the ETR. Publicly owned firms in Ethiopia may be expected to have lower ETRs for different reasons, such as widespread corruption or preferential treatment in competition for government contracts (Faccio, 2006). However the coefficient on *public* is consistently positive and mostly significant. This suggests that, far from representing a fiscal advantage, the presence of the public sector in a firm increases the control over its tax affaires and therefore it actually increases its effective tax rate. This effect is still significant once sectoral and regional differences are accounted for. This essentially answers the second research question by providing evidence that political connections do not help firms obtain lower ETR. Instead publicly owned firms face higher ETRs, a result that can be explained by higher control 'from within' and by the higher visibility of public firms.

Therefore the results on *size* and *public* suggest that, although tax preferences are indeed generous in the manufacturing sector in Ethiopia, they are not influenced by the lobbying of larger firms or by political connections. The last statement clearly is true to the extent that *public* captures the effect of political connections, which is argued in section 5.3.

Finally *reform* has a positive effect on the ETR across specifications, but it is not robust to dropping the two years of famine. This may indicate the difficulty of identifying the effect of the 2002 reform since a major famine broke out the following year, thus resulting in confounded effects. However section 5.5 shows that the average ETR is higher in the pre-reform period then in the post-reform one. Moreover the tax payments exercise

[43]Note that lobbying may originate in specific sectors that are more organized than others. However there is no evidence that size captures sector differences as it is non-significant both when dummies are included and when they are not, except when regional dummies are included.

in section 5.7.4 shows that, once the interaction between profit and reform is taken into account, the positive coefficient is confirmed. Therefore to answer the third research question, the results provide some (weak) evidence for a positive effect of the 2002 reform on the ETR in Ethiopia. Given that the statutory rate was decreased with the reform, this may be due to a behaviour consistent with the Laffer curve or to the increased effort in tax enforcement and in the fight to tax evasion. Or it may be a result of a combination of both elements.

5.10 Conclusion

Effective tax rates in Africa are often thought of as being very low, because of tax incentives and fiscal benefits. This chapter provided an empirical investigation of this issue by quantifying the tax payments of firms and thus the extent of tax preferences in Ethiopia. I find that tax preferences play a major role but that there is no evidence that they are influenced by lobbying and political connections. A number of econometric exercises and a descriptive analysis have allowed replying to the research questions that motivated this study (see section 5.9). However it needs to be stressed that both the quality of data and the weakness of some results impose caution in drawing policy implications. The empirical findings are supported by descriptive and qualitative elements that are presented in this chapter and in the broader context of this thesis.

The main contribution of this chapter is that it adds to the very small literature on ETR in Africa by virtually doubling it. This chapter offers for the first time evidence on corporate taxation in Ethiopia and particularly on effective tax rates. In this sense, this work aims at setting the basis for further research rather than being conclusive in itself. I show that there is some potential in analysing ETRs in the context of Africa, in the broader area of tax revenue mobilisation that has been largely focussed on the macroeconomic level so far.

Three issues arose in this work and they are summarized here as directions for future research. Firstly the availability and quality of data is probably the main challenge in studying taxation at the firm level in Africa. More effort should be put in developing and exploiting the existing sources of data, perhaps complementing them with additional information useful for the analysis of ETRs, such as additional variables on political connections. The industrial sector as a whole would ideally be considered to explore the differences between manufacturing and, for example, finance, construction and utilities. Secondly the theoretical framework and the econometric methodology used here could be

applied to other existing datasets that so far have been analysed in a less comprehensive way. Last but not least, the research on ETRs should be expanded to other countries in Africa. This would allow exploring the existence of common and distinctive patterns in the continent against which the results presented here could also be compared. Indeeed, as argued in Derashid and Zhang (2003), different regions in the world have different policies, levels of development and characteristics. These elements affect the results and they should be included in a meaningful interpretation that takes into account the context.

Appendices

5.A Treatment of current and deferred tax in the literature

Based on the difference between current and deferred tax, ETRs can be calculated using three definitions of tax payments in the numerator:

1. only current tax
2. total tax payments, including current and deferred
3. current tax plus a portion of deferred tax

As far as the last definition is concerned, one option is to include only the proportion of the deferred tax that is payable in the short term. Alternatively the calculation could be based on the present value of deferred taxes. A third option is to subtract from tax expense only the change in deferred tax (Omer et al., 1990). The implementation of the third definition requires a large amount of data and it poses a computational challenge, particularly when survey data as opposed to accounting data is used (Spooner, 1986). Some studies in the literature use current tax only, such as Kern and Morris (1992); Omer et al. (1993); Stickney and McGee (1982); Zimmerman (1983); Porcano (1986). However other authors, such as Kim and Limpaphayom (1998), use total tax payments arguing that deferred taxation is not widely used in Asian countries and indeed many companies do not even report this information. When using total tax payments, Omer et al. (1990) recommend the use of deferred tax expense rather than deferred tax change to avoid the introduction of systematic differences in ETR that the authors also find to be related to size.

Some studies in the literature follow the suggestion in Omer et al. (1990) and use the different ETR measures to check for robustness. Generally they find consistent results regardless of the measure used (Omer et al., 1993; Derashid and Zhang, 2003), therefore suggesting that it is not a critical apect for the validity of the analysis. Moreover section 5.5 shows that the issue of deferred taxes may not be substantial in the case of Ethiopia therefore making total tax payments a good variable for computing the ETR.

5.B Summary statistics of relevant variables

Table 5.B.1: Summary statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
ETR	0.083	0.119	0	0.978	3287
size	3.943	1.514	0	8.473	3287
sales	14.986	2.193	9.302	20.356	2993
cap int	0.061	0.115	0	2.681	3287
invest	0.258	0.684	0	9.891	3287
reform	0.279	0.448	0	1	3287
public	0.248	0.432	0	1	3287
export	0.019	0.114	0	0.993	3284
foreign capital	0.116	0.301	0	1	1262
age	20.044	17.513	0	86	3287
owners	2.731	5.521	0	153	2572
loss	0.49	0.5	0	1	3287
profit	13.495	2.52	6.105	20.127	3287
growth	0.129	0.768	-0.973	10	2626

5.C Discussion of events in 2002 and 2003

Exploring further the issue of the drop and subsequent increase in ETR in 2003-2004 , figures 5.C.1 and 5.C.2 show that both profits and sales experience a sharp decline in 2002, a year earlier than the observed drop in ETR. Two brief historical notes may help clarifying this. Firstly, while the peak of the drought was reached with the famine of 2002/03, its roots lie in the previous year. In fact the famine was officially recognized only at a stage when the drought had already heavily hit in the areas concerned. In 2002, faulty rains had disrupted production and caused an increase in malnutrition and decimation of herds. This already precarious situation, particularly in pastoralist areas, paved the way for the disastrous effects of the subsequent drought (Gill, 2010; Hammond and Maxwell, 2002). Second, in the early 2000s military tension was high between Ethiopia and Eritrea although the war was formally finished with the December 2000 peace agreement. Although a Boundary Commission agreed on a verdict in 2002, it was not until 2005 that both countries formally agreed to this verdict and that Ethiopia withdrew its troops. Given the complex situation of the time, it is not straightforward, and it may not even be correct, to attribute the sharp decrease in sales and profits to either the drought or military tension at the Eritrean border.

The difference in the timing of response of sales (2002) and tax (2003) however may be explained by the different factors that affect them. Indeed it may be possible that while profits and sales are already heavily affected by the war and the drought leading to the famine, the ETR may instead be affected by collection delays due to the emergency in 2003. Moreover there is historical evidence for Ethiopia that during times of internal conflict, as the early 2000s, industrial production can be disrupted because of difficulties in transport, delays in deliveries of raw materials and other inputs, and power shortages. In fact while the income tax take in absolute value may have decreased in those years, there is no reason for the ETR to decrease. If anything, in times of war tax rates may increase to finance military operations. In 2003 on the other hand, the intervention of donors and the management of the emergency might have caused a congestion in the public administration and thus a delay in tax collection.

The discussion above provides some support for the possibility of a different timing of the drop in profits and ETR. However it is important to consider the possibility of a lag in the data using detailed information from the survey and the tax legislation. First of all, it is worth noting that the survey is designed to contain data referring to the same survey year and thus lags should not occur. As far as tax law is concerned, firms are required to send

their tax declaration, together with the accounts and supporting documents, two to four months after the closure of the fiscal year (according to the accounting requirements and the type of books of accounts kept by the firm). This would then be between September and December. At this time firms have to pay tax as they already have an estimation of the amount due that will be then verified by the tax authority. Notwithstanding the 2002 tax reform, the procedure and timing remain essentially unchanged. The survey is then carried out in June, and data is collected for the previous year. At this point firms have closed the accounts for the previous year and they are also able to report the amount of tax paid. Enumerators visit the firms and they fill in the questionnaire which is mostly in the form of tables that contain the data on sales, inputs, etc. The discussion between the enumerator and the firm is focused on a single fiscal year, thus implying the absence of a lag.

Given the details of data collection and particularly its timing, it seems therefore unlikely that the survey actually reports lagged tax data in a systematic manner. However this cannot be asserted with certainty and surely not for 2003, when the data may suggest the presence of a lag in collection. However this year can reasonably be treated as an exception and indeed no other major event occurred in the period considered that could have caused a delay in tax collection.

Figure 5.C.1: Evolution of income in time

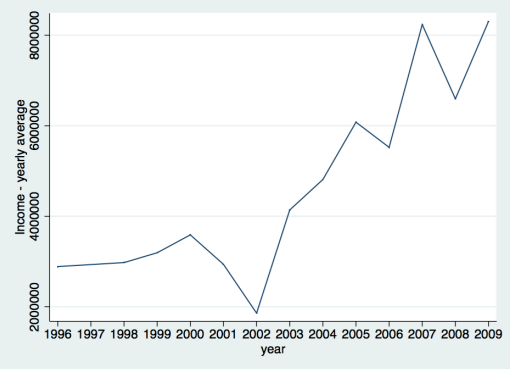
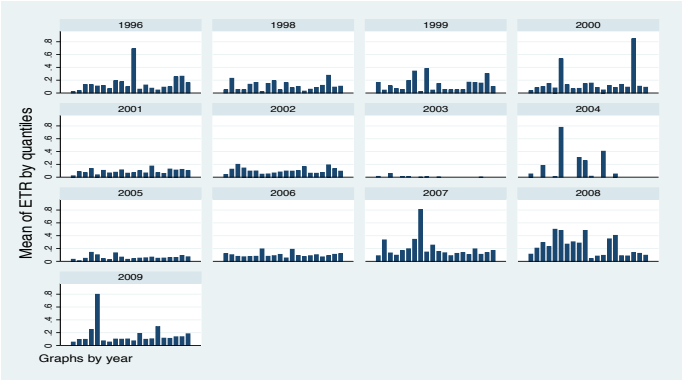


Figure 5.C.2: Evolution of sales in time

5.D Distribution of ETR by firm size over time

Figure 5.D.1: Scatter plot of profits and sales



Note: the plots report ETR by quantiles (20) of firm size, calculated using the number of employees in log.

5.E The determinants of profit

Table 5.E.1: Determinants of profits: Pooled OLS, FEM, REM and BE

	(1) OLS	(2) FEM	(3) REM	(4) BE
size	1.171***	0.471***	1.006***	1.291***
	(57.43)	(7.08)	(37.68)	(35.54)
cap int	4.967***	1.535***	3.600***	5.932***
	(24.69)	(3.34)	(17.42)	(14.07)
invest	0.366***	0.333***	0.328***	0.658***
	(11.02)	(8.66)	(11.95)	(6.54)
public	0.499***	0.341***	0.497***	0.183
	(7.26)	(3.04)	(6.03)	(1.26)
reform	0.915***	0.671***	0.787***	
	(16.92)	(8.14)	(16.34)	
age	-0.002	0.026**	0.002	-0.003
	(-1.16)	(2.58)	(0.95)	(-1.15)
Constant	8.139***	10.665***	8.697***	7.795***
	(116.48)	(31.53)	(90.29)	(64.80)
Observations	3287	3287	3287	3287
N_g		758.00	758.00	758.00
r2	0.74	0.24		0.78

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.F Analysis of fixed effects

Figure 5.F.1: Plot of fixed effects

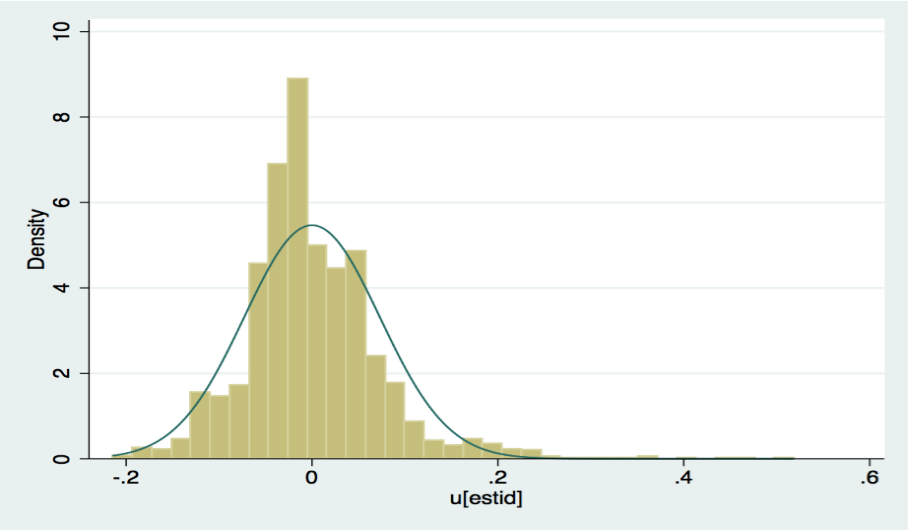


Table 5.F.1: Explaining the fixed effects

	(1)	(2)	(3)	(4)	(5)
size	-0.008***	-0.007***	-0.011***	-0.008***	-0.010***
	(-3.10)	(-2.90)	(-4.51)	(-3.14)	(-4.04)
cap int	-0.027	-0.019	-0.018	-0.007	-0.001
	(-0.90)	(-0.88)	(-0.84)	(-0.29)	(-0.06)
invest	0.002	0.001	-0.001	0.001	-0.001
	(0.34)	(0.21)	(-0.21)	(0.22)	(-0.19)
public	0.004	0.006	0.020**	0.012	0.023**
	(0.39)	(0.60)	(2.03)	(1.22)	(2.25)
age	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(-5.17)	(-5.54)	(-6.07)	(-5.64)	(-6.09)
export		-0.015	-0.009	-0.011	-0.004
		(-0.61)	(-0.36)	(-0.45)	(-0.18)
growth		0.001	0.002	0.001	0.002
		(0.21)	(0.60)	(0.32)	(0.57)
loss		-0.008	-0.009	-0.006	-0.007
		(-1.33)	(-1.57)	(-1.06)	(-1.18)
Constant	0.049***	0.050***	0.077***	0.049***	0.066***
	(5.72)	(5.75)	(7.99)	(4.63)	(6.01)
Region dummies	no	no	yes	no	yes
Sector dummies	no	no	no	yes	yes
Observations	3287	2625	2625	2625	2625
N_g	758.00	733.00	733.00	733.00	733.00
r2	0.08	0.09	0.15	0.14	0.18

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.G Tables with coefficients for region and sector dummies

Table 5.G.1: BE results with sector dummies

	(1)	(2)	(3)	(4)
size	-0.001	-0.007	0.000	-0.002
	(-0.31)	(-1.60)	(0.09)	(-0.58)
cap int	-0.088***	-0.152***	-0.053**	-0.071**
	(-2.87)	(-2.88)	(-2.03)	(-2.23)
invest	-0.013*	-0.004	-0.008	-0.012*
	(-1.73)	(-0.51)	(-1.12)	(-1.66)
public	0.025**	0.095***	0.026**	0.031***
	(2.34)	(5.29)	(2.22)	(2.94)
age	0.001***	0.000	0.001**	0.001***
	(3.59)	(0.16)	(2.47)	(3.52)
foreign capital		0.018		
		(0.90)		
export		0.003	-0.037	
		(0.06)	(-1.31)	
growth		-0.005	0.000	
		(-0.98)	(0.09)	
owners		-0.002		
		(-0.98)		
plastic		0.004	-0.001	0.001
		(0.17)	(-0.10)	(0.06)
furniture		-0.007	-0.004	-0.007
		(-0.48)	(-0.36)	(-0.79)
print		0.032*	0.019	0.034***
		(1.85)	(1.49)	(3.06)
footwear		0.000	0.006	-0.003
		(0.01)	(0.36)	(-0.20)
flour		-0.015	0.005	-0.002
		(-0.52)	(0.35)	(-0.15)
bakery		0.027*	0.041***	0.042***
		(1.74)	(3.69)	(4.38)
cement		-0.020	0.002	-0.015
		(-0.90)	(0.12)	(-1.27)
Constant	0.069***	0.087***	0.059***	0.065***
	(7.93)	(4.58)	(5.01)	(6.08)
Observations	3287	655	2625	3287
N_g	758.00	420.00	733.00	758.00
r2	0.06	0.15	0.06	0.11

Note: t statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5.G.2: BE results with regions

	(1)	(2)	(3)	(4)
size	-0.001	-0.012***	-0.004	-0.005**
	(-0.31)	(-2.77)	(-1.51)	(-2.03)
cap int	-0.088***	-0.149***	-0.057**	-0.082***
	(-2.87)	(-2.97)	(-2.32)	(-2.76)
invest	-0.013*	-0.005	-0.012*	-0.017**
	(-1.73)	(-0.72)	(-1.72)	(-2.36)
public	0.025**	0.108***	0.038***	0.041***
	(2.34)	(6.00)	(3.23)	(3.90)
age	0.001***	0.000	0.001**	0.001***
	(3.59)	(0.06)	(2.19)	(3.10)
foreign capital		0.016		
		(0.82)		
export		0.009	-0.039	
		(0.21)	(-1.40)	
growth		-0.003	0.002	
		(-0.63)	(0.39)	
owners		-0.002		
		(-0.95)		
afar		-0.052	0.051	0.050
		(-0.56)	(1.08)	(1.11)
tigray		-0.014	0.027	0.024
		(-0.40)	(1.52)	(1.59)
amhara		0.003	-0.021	-0.036***
		(0.16)	(-1.63)	(-3.19)
oromia		-0.018	-0.027***	-0.027***
		(-1.21)	(-2.79)	(-3.21)
somalie		-0.058	-0.078*	-0.080**
		(-1.05)	(-1.84)	(-2.09)
snnpr		-0.059***	-0.051***	-0.051***
		(-3.02)	(-4.39)	(-4.88)
gambela		-0.194**	-0.125**	-0.131**
		(-2.03)	(-2.06)	(-2.39)
harari		-0.021	-0.029	-0.031
		(-0.57)	(-0.99)	(-1.19)
diredawa		-0.083***	-0.064***	-0.061***
		(-3.19)	(-3.34)	(-3.53)
Constant	0.069***	0.119***	0.094***	0.098***
	(7.93)	(7.03)	(8.80)	(10.18)
Observations	3287	655	2625	3287
N_g	758.00	420.00	733.00	758.00
r2	0.06	0.18	0.10	0.13

Note: t statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.H Results including loss variable

Table 5.H.1: BE with loss variable

	(1)	(2)	(3)	(4)	(5)
size	-0.001	-0.001	-0.011**	-0.002	0.000
	(-0.31)	(-0.24)	(-2.28)	(-0.81)	(0.03)
cap int	-0.088***	-0.085***	-0.133**	-0.041	-0.058**
	(-2.87)	(-2.77)	(-2.52)	(-1.59)	(-2.29)
invest	-0.013*	-0.013*	-0.004	-0.012*	-0.010
	(-1.73)	(-1.82)	(-0.53)	(-1.73)	(-1.38)
public	0.025**	0.025**	0.109***	0.040***	0.023**
	(2.34)	(2.39)	(5.93)	(3.38)	(2.00)
age	0.001***	0.001***	-0.000	0.001**	0.001**
	(3.59)	(3.63)	(-0.03)	(2.18)	(2.52)
loss		-0.008	-0.009	-0.007	-0.006
		(-1.39)	(-0.94)	(-1.04)	(-0.97)
foreign capital			0.020		
			(1.05)		
owners			-0.002		
			(-1.01)		
export			0.017	-0.029	-0.040
			(0.38)	(-1.04)	(-1.44)
growth			-0.003	0.001	0.000
			(-0.58)	(0.29)	(0.06)
Constant	0.069***	0.072***	0.110***	0.081***	0.070***
	(7.93)	(8.02)	(5.45)	(6.39)	(7.00)
Region dummies	no	no	yes	yes	no
Sector Dummies	no	no	yes	yes	no
Observations	3287	3287	655	2625	2625
N_g	758.00	758.00	420.00	733.00	733.00
r2	0.06	0.07	0.20	0.12	0.04

Note: t statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.I Tables for robustness checks

Table 5.I.1: Results without years 2003 and 2004

	(1) FEM	(2) FEM	(3) FEM	(4) BE	(5) BE	(6) BE
size	0.012**	0.010*	0.005	0.000	-0.003	0.002
	(2.15)	(1.79)	(0.59)	(0.15)	(-1.02)	(0.54)
cap int	-0.048*	-0.052*	-0.073**	-0.089***	-0.059**	-0.054**
	(-1.80)	(-1.95)	(-2.00)	(-2.86)	(-2.28)	(-1.97)
invest	-0.015***	-0.015***	-0.016***	-0.011	-0.012	-0.007
	(-5.72)	(-5.76)	(-5.10)	(-1.49)	(-1.43)	(-0.86)
public	0.028*	0.030**	0.020	0.031***	0.044***	0.032***
	(1.90)	(1.96)	(1.21)	(2.87)	(3.57)	(2.62)
reform	-0.020*		-0.035			
	(-1.68)		(-1.05)			
age	0.003**	0.002*	0.006***	0.001***	0.001**	0.001**
	(2.42)	(1.72)	(3.14)	(3.52)	(2.05)	(2.41)
reform*size			-0.000			
			(-0.01)			
export			0.114		-0.047	-0.042
			(1.19)		(-1.59)	(-1.41)
growth			-0.000		0.001	0.001
			(-0.08)		(0.10)	(0.11)
Constant	-0.015	0.023	-0.032	0.067***	0.093***	0.056***
	(-0.43)	(0.80)	(-0.62)	(7.54)	(8.30)	(4.50)
Year dummies	no	yes	no	no	no	no
Region dummies	no	no	no	no	yes	no
Sector dummies	no	no	no	no	no	yes
Observations	3066	3066	2430	3066	2430	2430
N_g	757.00	757.00	724.00	757.00	724.00	724.00
r2	0.02	0.03	0.02	0.07	0.10	0.07

Note: t statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable is the ETR.

Table 5.I.2: FE estimation results with sales as a measure of size

	(1)	(2)	(3)	(4)	(5)
sales	0.005	0.005	0.004	0.004	0.004
	(1.09)	(1.11)	(0.91)	(0.66)	(0.72)
cap int	-0.052**	-0.051**	-0.067***	-0.072**	-0.075**
	(-2.13)	(-2.12)	(-2.67)	(-2.26)	(-2.44)
invest	-0.014***	-0.014***	-0.013***	-0.016***	-0.014***
	(-5.61)	(-5.57)	(-4.65)	(-4.78)	(-4.14)
public	0.005	0.007	0.016	0.069***	0.071***
	(0.34)	(0.43)	(0.98)	(3.31)	(3.37)
reform	0.037***	0.024		0.025*	
	(3.66)	(0.94)		(1.87)	
age	-0.003**	-0.003**	0.003**	-0.000	0.003**
	(-1.99)	(-2.01)	(2.12)	(-0.15)	(2.15)
reform*size		0.003			
		(0.54)			
export				-0.036	-0.027
				(-0.63)	(-0.52)
growth				-0.002	-0.001
				(-0.59)	(-0.15)
owners				0.001	0.001
				(0.81)	(0.57)
Constant	0.060	0.059	-0.015	0.020	-0.028
	(0.87)	(0.86)	(-0.24)	(0.23)	(-0.34)
Years	no	no	yes	no	yes
Observations	2993	2993	2993	1938	1938
N_g	752.00	752.00	752.00	679.00	679.00
r2	0.02	0.02	0.08	0.03	0.07
r2_b	0.01	0.01	0.04	0.04	0.05
r2_o	0.01	0.01	0.07	0.03	0.04
F	9.70	8.31	22.52	5.74	7.65
rho	0.48	0.48	0.44	0.47	0.53

Note: t statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable is the ETR.

Table 5.I.3: BE results with regions and sales as a measure of size

	(1)	(2)	(3)	(4)
sales	-0.002	-0.007**	-0.004**	-0.005**
	(-0.87)	(-2.48)	(-2.33)	(-2.54)
cap int	-0.079**	-0.115**	-0.042	-0.060*
	(-2.31)	(-2.14)	(-1.64)	(-1.81)
invest	-0.013	-0.004	-0.012*	-0.017**
	(-1.59)	(-0.58)	(-1.66)	(-2.14)
public	0.026**	0.103***	0.041***	0.042***
	(2.42)	(5.87)	(3.60)	(3.88)
age	0.001***	-0.000	0.001**	0.001**
	(2.82)	(-0.26)	(2.18)	(2.30)
foreign capital		0.016		
		(0.82)		
export		0.007	-0.033	
		(0.16)	(-1.19)	
growth		-0.005	0.002	
		(-1.02)	(0.40)	
owners		-0.002		
		(-1.10)		
afar		-0.054	0.058	0.063
		(-0.58)	(1.25)	(1.32)
tigray		-0.012	0.027	0.032**
		(-0.35)	(1.53)	(1.98)
amhara		0.008	-0.021*	-0.033***
		(0.38)	(-1.65)	(-2.75)
oromia		-0.019	-0.027***	-0.030***
		(-1.24)	(-2.76)	(-3.31)
somalie		-0.050	-0.078*	-0.078*
		(-0.91)	(-1.85)	(-1.94)
snnpr		-0.060***	-0.054***	-0.052***
		(-3.02)	(-4.60)	(-4.76)
gambela		-0.179*	-0.127**	-0.129**
		(-1.89)	(-2.10)	(-2.25)
harari		-0.019	-0.028	-0.025
		(-0.53)	(-0.99)	(-0.91)
diredawa		-0.081***	-0.065***	-0.066***
		(-3.11)	(-3.40)	(-3.66)
Constant	0.091***	0.180***	0.142***	0.147***
	(3.64)	(4.39)	(5.27)	(5.76)
Observations	2993	655	2625	2993
N_g	752.00	420.00	733.00	752.00
r2	0.05	0.18	0.10	0.12

Note: t statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable is always the ETR.

Table 5.I.4: BE results with sectors and sales as a measure of size

	(1)	(2)	(3)	(4)
sales	-0.002	-0.004	-0.001	-0.001
	(-0.87)	(-1.22)	(-0.54)	(-0.71)
cap int	-0.079**	-0.133**	-0.050*	-0.069*
	(-2.31)	(-2.41)	(-1.83)	(-1.96)
invest	-0.013	-0.003	-0.008	-0.013*
	(-1.59)	(-0.44)	(-1.08)	(-1.70)
public	0.026**	0.091***	0.029**	0.030***
	(2.42)	(5.17)	(2.52)	(2.81)
age	0.001***	-0.000	0.001***	0.001***
	(2.82)	(-0.05)	(2.60)	(2.66)
foreign capital		0.017		
		(0.87)		
export		-0.000	-0.033	
		(-0.01)	(-1.18)	
growth		-0.006	0.001	
		(-1.22)	(0.16)	
owners		-0.002		
		(-1.09)		
plastic		0.002	0.000	-0.001
		(0.09)	(0.01)	(-0.10)
furniture		-0.008	-0.006	-0.008
		(-0.50)	(-0.54)	(-0.89)
media		0.032*	0.018	0.030***
		(1.81)	(1.45)	(2.60)
shoes		-0.001	0.005	0.004
		(-0.06)	(0.32)	(0.24)
grains		-0.013	0.005	-0.005
		(-0.44)	(0.38)	(-0.41)
bakery		0.028*	0.040***	0.045***
		(1.73)	(3.54)	(4.26)
concrete		-0.019	-0.000	-0.012
		(-0.86)	(-0.02)	(-0.97)
Constant	0.091***	0.118**	0.076**	0.082***
	(3.64)	(2.57)	(2.53)	(2.90)
Observations	2993	655	2625	2993
N_g	752.00	420.00	733.00	752.00
r2	0.05	0.15	0.06	0.09

Note: t statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable is always the ETR.

Table 5.I.5: Results imputing zeroes for missing observations of tax

	(1) FEM	(2) FEM	(3) BE	(4) BE	(5) BE	(6) est6
size	0.014***	0.010**	0.013*	-0.003	-0.006**	-0.001
	(3.28)	(2.29)	(1.96)	(-1.25)	(-2.50)	(-0.36)
capint	-0.015	-0.027	-0.058*	-0.056**	-0.012	-0.008
	(-0.60)	(-1.12)	(-1.78)	(-2.47)	(-0.69)	(-0.42)
invest	-0.011***	-0.011***	-0.010***	-0.014**	-0.013**	-0.011*
	(-5.38)	(-5.00)	(-4.21)	(-2.43)	(-2.24)	(-1.79)
public	0.010	0.019	-0.003	0.018**	0.031***	0.020*
	(0.81)	(1.64)	(-0.21)	(1.99)	(2.89)	(1.85)
reform	-0.014**		-0.026			
	(-2.05)		(-1.33)			
age	-0.000	-0.001	0.002	0.001***	0.001***	0.001***
	(-0.06)	(-0.87)	(1.27)	(4.34)	(2.65)	(3.02)
ref_size			0.000			
			(0.11)			
export			0.011		-0.026	-0.031
			(0.28)		(-1.15)	(-1.35)
growth			-0.006		0.002	0.001
			(-1.47)		(0.60)	(0.31)
years	no	yes	no	no	no	no
regions	no	no	no	no	yes	no
sectors	no	no	no	no	no	yes
Constant	0.022	0.060**	0.004	0.064***	0.089***	0.050***
	(0.87)	(2.39)	(0.10)	(8.68)	(9.46)	(4.76)
Observations	3942	3942	3157	3942	3157	3157
N_g	852.00	852.00	819.00	852.00	819.00	819.00
r2	0.01	0.09	0.01	0.06	0.09	0.06

Note: t statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable is always the ETR.

Table 5.I.6: Results with all variables lagged, except tax

	(1) FEM	(2) FEM	(3) BE	(4) BE	(5) BE
L.size	-0.015	-0.017	0.006	0.003	0.004
	(-0.87)	(-0.91)	(0.65)	(0.33)	(0.39)
L.cap int	-0.325*	-0.364**	-0.167	-0.152	-0.151
	(-1.95)	(-2.22)	(-1.45)	(-1.31)	(-1.24)
L.invest	0.062	0.061	-0.009	-0.018	-0.010
	(0.75)	(0.71)	(-0.41)	(-0.79)	(-0.44)
public	-0.034	-0.007	-0.051	-0.035	-0.049
	(-0.51)	(-0.12)	(-1.45)	(-0.96)	(-1.38)
reform	0.104***				
	(2.67)				
L.age	-0.010	0.008**	0.002**	0.002**	0.002**
	(-1.57)	(2.24)	(2.30)	(2.51)	(2.25)
years	no	yes	no	no	no
regions	no	no	no	yes	no
sectors	no	no	no	no	yes
Constant	0.367***	0.008	0.086***	0.095***	0.102***
	(2.91)	(0.10)	(2.87)	(2.77)	(2.69)
Observations	1563	1563	1563	1563	1563
N_g	577.00	577.00	577.00	577.00	577.00
r2	0.01	0.03	0.02	0.05	0.03

Note: t statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable is always the ETR.

Table 5.I.7: Results with $ETR < 2$

	(1) FEM	(2) FEM	(3) FEM	(4) BE	(5) BE	(6) BE
size	0.008	0.007	0.008	-0.004	-0.011**	-0.006
	(0.95)	(0.82)	(0.77)	(-1.01)	(-2.16)	(-1.22)
cap int	0.005	-0.014	-0.031	-0.096**	-0.048	-0.061
	(0.15)	(-0.42)	(-0.62)	(-2.14)	(-1.13)	(-1.37)
invest	-0.016***	-0.014***	-0.015***	-0.026**	-0.022*	-0.018
	(-5.80)	(-4.89)	(-4.11)	(-2.39)	(-1.78)	(-1.51)
public	0.014	0.023	0.005	0.028*	0.058***	0.037*
	(0.91)	(1.52)	(0.28)	(1.82)	(2.92)	(1.89)
reform	0.043***		0.033			
	(3.12)		(0.83)			
age	-0.004**	0.002	-0.004**	0.001**	0.000	0.000
	(-2.11)	(1.09)	(-2.12)	(2.28)	(0.57)	(0.75)
reform*size			0.002			
			(0.27)			
export			0.066		-0.042	-0.057
			(0.76)		(-0.88)	(-1.20)
growth			-0.013		0.008	0.007
			(-1.54)		(0.95)	(0.77)
Constant	0.131***	0.050	0.141**	0.098***	0.137***	0.113***
	(2.95)	(1.12)	(2.37)	(7.59)	(7.56)	(5.67)
Year dummies	no	yes	no	no	no	no
Region dummies	no	no	no	no	yes	no
Sector dummies	no	no	no	no	no	yes
Observations	3313	3313	2643	3313	2643	2643
N_g	758.00	758.00	737.00	758.00	737.00	737.00
r2	0.01	0.04	0.02	0.03	0.05	0.03

Note: t statistics in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable is the ETR. *Owners* and *forcap* are excluded from the set of control variables because they are always non-significant and their inclusion would also reduce considerably the sample size.

Table 5.I.8: Results with $ETR < 2$ but constrained to a maximum of 1

	(1) FEM	(2) FEM	(3) FEM	(4) BE	(5) BE	(6) BE
size	0.007	0.007	0.001	-0.003	-0.008**	-0.004
	(1.03)	(1.10)	(0.10)	(-0.88)	(-2.08)	(-0.93)
cap int	-0.027	-0.037*	-0.046*	-0.098***	-0.062*	-0.069*
	(-1.27)	(-1.84)	(-1.76)	(-2.64)	(-1.84)	(-1.95)
invest	-0.000**	-0.000**	-0.000**	-0.000	-0.000	-0.000
	(-1.99)	(-2.29)	(-2.21)	(-0.65)	(-0.52)	(-0.53)
public	0.017	0.025*	0.006	0.027**	0.051***	0.034**
	(1.14)	(1.69)	(0.40)	(2.12)	(3.22)	(2.18)
reform	0.035***		0.027			
	(3.10)		(0.73)			
age	-0.003**	0.002	-0.004**	0.001***	0.000	0.000
	(-2.09)	(1.60)	(-2.28)	(2.71)	(0.76)	(1.06)
reform*size			0.003			
			(0.44)			
export			0.061		-0.040	-0.048
			(1.04)		(-1.12)	(-1.33)
growth			-0.000		-0.001	-0.001
			(-1.46)		(-0.37)	(-0.64)
Constant	0.111***	0.031	0.159***	0.083***	0.120***	0.093***
	(2.98)	(0.88)	(3.02)	(7.88)	(8.31)	(5.81)
Year dummies	no	yes	no	no	no	no
Region dummies	no	no	no	no	yes	no
Sector dummies	no	no	no	no	no	yes
Observations	3363	3363	2684	3363	2684	2684
N_g	758.00	758.00	739.00	758.00	739.00	739.00
r2	0.01	0.05	0.01	0.04	0.07	0.04

Note: t statistics in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable is the ETR. *Owners* and *forcap* are excluded from the set of control variables because they are always non-significant and their inclusion would also reduce considerably the sample size.

Chapter 6

Conclusions

This thesis analyses tax revenue mobilisation in Ethiopia in a comprehensive way, encompassing qualitative and quantitative elements as well as macroeconomic and microeconomic perspectives. The issue of tax revenue mobilisation is particularly relevant in Ethiopia as the tax share there still falls below the average of other African countries and the target level of 15%. This relevance is reflected in the top priority that the government has given to taxation in the Growth and Transformation Plan (GTP) and in the increasing attention that donors are paying to this topic. Given the deep intertwining of taxation and aid, and the need to ensure that aid is spent effectively, the relation between aid and taxation is a central theme to this thesis.

This thesis contributes both to the literature and to the policy debate. Firstly, by providing evidence on the Ethiopian experience, it shows the advantages of a case study approach as a way to overcome the limits of the cross-country literature. By focussing on a single country, the analysis can explicitely recognize that taxation is a multifaceted issue by adopting a set of different methodological tools, yet ensuring coherence in the case study context. Secondly this thesis contributes to the policy debate by providing evidence of a positive relation between aid and taxation that is robust to the use of different methods and specifications. Last but not least it makes a conceptual contribution by providing a theoretical framework to think about the tax take at the microeconomic level, in the context of the analysis of effective tax rates in chapter 5.

6.1 Main findings and reflections on thesis

The main finding of this thesis is the positive relation between aid and tax in Ethiopia. The investigation of this relation is the main research question motivating this work and is a

strong common thread that links particularly chapters 2, 3, and 4. While the three chapters are motivated by the same core question, they take different approaches to answering it. Chapter 2 reports a qualitative analysis including an historical account of taxation and aid in Ethiopia during the period for which data is available. This historical account, largely based on secondary sources, is complemented with primary information obtained during in-depth interviews to high-level officials in the Government of Ethiopia and in donor agencies, as well as independent experts. In chapter 3 I estimate a tax effort model in a case study context, which is a novelty in a literature largely dominated by cross-country studies. The tax effort framework has the advantage of putting the aid-tax relation in the economic context and perspective of the country analysed, both by taking variables in shares of GDP and by including proxies of the tax base as control variables. Chapter 4 takes a CVAR approach, where only fiscal variables are included, in log transformation. This approach has the important advantage, with respect to chapter 3, of taking into account endogeneity by estimating simultaneous equations. By analysing tax effort and aid from these different perspectives, this thesis provides a unique in-depth and comprehensive analysis of this issue in the Ethiopian context.

The main explanation provided for the positive relation between aid and tax is capacity building and technical assistance, through which aid can decrease both administrative costs (by, for example, introducing IT systems that make the tax administration more effective and efficient) and political costs (by having the international backing of foreign donors, the government may be able to increase legitimacy of tax reform). While a portion of this capacity building is captured by the financial flows that I am measuring, not all of it is. This is particularly the case of policy advice and of programs that are not delivered through the government's budget. While these parts of capacity building are not captured in my measure of aid, they are explored in chapter 2. Moreover the intensity of these activities is likely to be highly correlated with the amount of financial flows into the budget, as they both depend on the quality of relations between the government and donors. This explanation, based on capacity building, is also consistent with the results obtained in the disaggregated tax equations in chapter 3 (section 3.6), where aid appears to be mostly associated with direct and trade taxes. In the case of direct taxes, aid may influence the ability of the government to collect taxes from 'hard to tax' handles. In addition, given the ambitious nature of the government's development plans and their centrality to its political legitimacy, the availability of foreign resources may give momentum to increased tax revenue mobilisation; it may even represent an incentive for it, due to the 'shame of

aid' rooted in Ethiopian culture.

Since endogeneity of the aid variables is likely the greatest limitation of this work, it is worth reflecting on how the various econometric methods adopted in this thesis help tackling it. In a time series setting the problem is somewhat mitigated with respect to the cross-country case, particularly in presence of cointegration. In both chapters 3 and 4 cointengration can be confirmed and therefore the long run results do not suffer from concerns related to endogeneity. Clearly however in the case of the ECM in chapter 3, it is difficult to make causal statements. This is particularly true in the short run part of the exercise where the issue needs to be explicitly tackled. I take a number of measures to address endogeneity in the short run part of the ECM. First, I adopt an instrumental variable approach. A number of possible instrumental variables are tested but most of them are not satisfactory in terms of validity. Moreover the time series context makes the identification of an instrument even harder, due to limitations in data availablity for the relatively long period considered. The best available solution is the use of lags, that are valid instruments at least for grants. While the limitations of the use of lags are noted in chapter 3, it is at least partly reassuring that the main results are largely confirmed. In addition I address the possibility of an omitted variable problem by including the variable that may be the main source of bias: governance. Secondly, I use the qualitative evidence from chapter 2 to explore the possible sources of endogeneity in the specific context of Ethiopia. In section 3.5.1, drawing larlegy from chapter 2, I argue that aid decisions are largely exogenous to the government decision making process in Ethiopia. However it is really in chapter 4 that this issue can be fully addressed, since the CVAR framework allows the estimation of simultaneous equations without making assumptions about endogeneity. In addition to confirming the previous results on aid and tax, the CVAR methodology provides some evidence for the exogeneity of loans, particularly in the identified system, and no support for the endogeneity of grants, that appear the least adjusting variable in the tests for a unit vector in alpha (see section 4.8.5). Therefore the main result of this thesis, showing a positive relation between aid and tax, is largely supported by all chapters. Endogeneity does not seem to affect it in any substantial way, although causality cannot be established with absolute confidence.

The discussion on endogeneity clearly exemplifies how chapters 2, 3, and 4 are highly complementary to each other, while adding specific insights to the thesis.

Chapter 2 bridges the qualitative and quantitative sides of tax revenue mobilisation, particularly by underlining the political and cultural aspects of the aid-tax relation. It

therefore serves the econometric analysis in two ways, besides representing a contribution by itself. Firstly it helps in designing the econometric models of chapters 3 and 4 and in understanding the econometric challenges that they present. Most notably, it sheds light on the nature and extent of regime changes that may lead to structural breaks. Secondly the analysis of chapter 2 is useful in interpreting the econometric results and in ensuring that the conclusions are consistent with the Ethiopian context, which is all the more important in presence of small samples.

Chapter 3 offers a broader insight into tax revenue mobilisation in the context of the Ethiopian economy, taking into account the effect of different tax bases. By doing this it offers important insights into how the sectoral composition of the economy influences tax revenue mobilisation. While trade is confirmed as a major positive determinant of the tax share, agriculture has a negative effect on domestic taxes (direct and indirect) in particular. This effect is only clear in the disaggregated tax equations since the expected negative sign is contrasted by the positive effect on trade taxes in the aggregate tax equation. Furthermore manufacturing is found to have a large and significant effect on the tax share, due not only to the higher visibility and accessibility of this sector but also to the fact that firms act as a tax collectors for indirect and employment taxation.

Chapter 4 contributes to the thesis by including other fiscal variables in the equation, most notably public expenditure that is further disaggregated into recurrent and capital spending. By doing this, it offers a broader view on the fiscal dynamics in Ethiopia. It provides evidence of a long-run domestic budget equilibrium that excludes foreign aid. This implies that the government makes long term plans based on domestic sources, treating aid as an addition to such pre-existing long run relation. By looking at adjustment coefficients we also find that spending plans are mainly driven by tax revenue, while expenditure is the most adjusting variable. In addition we find that government spending is positively associated with both aid variables and this relation is particularly strong between capital expenditure and grants, as shown in our 'alternative system'. Finally we identify a donor disbursement rule whereby donors back proven commitment to increased expenditure with additional funding, particularly grants.

Therefore, while the three chapters are strongly linked by a common research question, each of them explores different specific issues and provides additional contributions to the main research question on aid and tax.

Finally chapter 5 is somehow different from the previous three chapters since it takes a microeconomic perspective by focussing on the manufacturing sector, while the rest of the

thesis is largely focussed on the macro level. However this chapter is actually connected to chapter 3 and it somehow stems from that analysis. In fact the effective tax rate essentially mirrors the tax to GDP ratio at the firm level, particularly in the manufacturing sector. Moreover the analysis of business taxation follows from the importance of the manufacturing sector as a determinant of the tax share emerging from chapter 3. Business profits tax represents already a substantial share of total revenue in Ethiopia, and it is likely to play an increasingly important role as industrial development unfolds (see chapter 1). Moreover chapter 5 draws largely from the qualitative work summarised in chapter 2, particularly as regards tax legislation and the role of the business sector in the Ethiopian economy.

By focusing on ETRs, I am able to quantify tax payments by firms and assess the extent of tax preferences in Ethiopia. I find that tax incentives are indeed generous in the Ethiopian manufacturing sector, with most firms facing an ETR well below the statutory rate. The econometric exercise allows the identification of some of the regulatory sources of tax preferences such as regional development and incentives for investment. However the analysis explores also less official sources of tax preferences such as lobbying and political connections. While these elements are not easily pinned down in a precise manner, this analysis nonetheless allows the identification of some aspects of it. By using proxies to capture these aspects, I find that effective tax rates do not seem to be influenced by the lobbying of larger firms or by political connections. These results support the 'political cost hypothesis', postulating a positive relation between visibility, and particualrly size, and tax payments. This hypothesis is particularly plausible in the Ethiopian context where the socialist tradition has resulted in a larger role of the state and in a perception of the private sector as purely rent seeking, as discussed in chapter 2.

6.2 Implications for research and practice

The main implication for further research stemming from this thesis regards the importance of using mixed methods, including both qualitative and quantitative analysis. The three quantitative chapters, namely 3, 4 and 5, benefit hugely from a deep understanding of the Ethiopian context both in the design phase of the analysis and in the interpretation of results. Moreover the in-depth analysis of taxation in Ethiopia allows this thesis to make a substantial contribution to the existing knowledge on taxation and aid in the specific context of Ethiopia, attempting to take into account all the economic, political and cultural factors at play.

As far as the implications for empirical analysis are concerned, this thesis shows the potentially valuable contribution that time series analysis can offer even in a small sample setting. While parsimony and caution are due when using small samples, chapters 3 and 4 show that the main result of a positive relation between aid and tax is robust not only to changes in specifications but also to the adoption of different methods. They therefore make a case for further research at the macroeconomic level in Africa, despite criticism related to data quality and small samples. Indeed I show that this type of research can provide answers to policy relevant questions that are central to the debate on African development. Moreover as African countries continue improving their statistics, studies like the ones presented here should become more common and increasingly robust.

As far the microeconomic empirical side is concerned, chapter 5 shows that the analysis of taxation at the micro level is feasible and it can provide useful insights. Clearly the analysis can be much improved and a few important caveats remain in terms of data availability and methods. Despite these issues however I believe it is valuable to quantify the extent of fiscal incentives, that are often presented as one of the main obstacles to tax revenue mobilisation in Africa. Moreover, despite problems with measurement, the analysis of ETR can offer some indications on the role of lobbying and political connections. The analysis presented in chapter 5 is clearly far from being exhaustive in itself. It rather aims at being a starting point for further research on this potentially important, and still largely underdeveloped, area of economic research.

Last but not least, this thesis has a few policy implications. The main result is the positive relation between aid and taxation in Ethiopia. In terms of policy, it implies that donors should not be concerned about adverse fiscal effects of aid in Ethiopia, or at least not as far as taxation is concerned. Therefore the argument of a crowding out effect is particularly ill-grounded in the Ethiopian case and it cannot be used to justify lower aid levels[1]. This analysis has shown that aid instead is beneficial to tax revenue mobilisation and therefore support to tax policy and administration should continue to be a priority in the development agenda. Donors can play an important role in domestic revenue mobilisation by providing international support to politically difficult reform, by building capacity, and by offering advice on both tax policy and administration reforms.

As this thesis started with a comparison of tax and aid in Ethiopia with the broader African context, it is useful to reflect on the validity of my results for other countries in

[1]Ethiopia is not facing the threat of decreasing aid flows today, but it may be in the future in the context of a possible scaling down of aid (Gupta et al., 2006).

Africa. While I have argued that the case of Ethiopia is unique, it shares with other countries the common challenge of increasing domestic revenue while receiving large amounts of aid. Moreover the Ethiopian uniqueness, while it is deeply rooted in the national culture, becomes less and less distinctive as the colonial legacy looses its importance over time; and as African countries become more willing and able to be independent from foreign influence.

In terms of the other tax determinants, the agricultural sector emerges as a constraint to increasing the tax share and particularly as far as domestic taxes are concerned. While subsistence in agriculture is widespread in Ethiopia, reforms to increase the tax contribution from this large sector should be considered, including a review of the land tax. On the other hand the manufacturing sector represents an opportunity for increasing the tax share. Not only is this sector 'easier to tax' because of its higher visibility and accessibility than, for example, the agricultural sector; it also acts as a collector of taxes on salaries and goods therefore having a large revenue generating potential.

While the manufacturing sector is found to be already beneficial to tax revenue, it has the potential to become increasingly important as a tax contributor. Chapter 5 shows that tax benefits are widely used in the manufacturing sector, but they do not seem to be influenced by lobbying and political connections. The balance between providing incentives for industrial development and mobilising public revenue is to be considered carefully by policy makers in Ethiopia, and different policy options need to be evaluated.

6.3 Further research

Besides representing a stand-alone work, this thesis has also prompted many ideas for future research and for refining the existing analysis. I mention here only a few of the ones I hope to develop following this thesis.

Chapter 2 can certainly be refined by focusing more on specific issues or a time period (e.g. the EPRDF period alone), to become fully a stand alone piece without the ancillary role of providing support for the rest of the thesis.

The CVAR analysis of chapter 4 could be further developed by including growth in the system, and aggregating fiscal variables in more general headings such as domestic revenue, expenditure and aid. This would give additional and interesting insights into the relation of both aid and fiscal variables with economic growth.

The analysis of tax revenue mobilisation was largely carried out at the national level in this thesis. However Ethiopia presents a federal structure that implies also revenue

collection and other fiscal powers for the regions. An analysis of the fiscal dynamics at the sub-national level would provide additional insight into a layer of government that may become increasingly important in revenue collection. Moreover the fiscal effects of the block grant that the central government provides to the regions could be evaluated.

Last but not least, the effective tax rate exercise should be both refined by looking for additional data to capture political connections and by exploring further interaction effects between explanatory variables. Moreover a similar analysis could be carried out for other countries with available data to build up a body of evidence on corporate taxation in Africa. This would be useful in two ways. Firstly such body of African research could be compared with evidence from other regions of the world to evaluate whether Africa displays different patterns. Secondly it would allow a comparison of country level experiences on firm-level taxation within Africa. I believe there is great potential in carrying out a similar anlaysis of ETR using administrative data (i.e. tax returns), particuarly given the limitations of firm-level surveys. In further developing this analysis with new and better data, chapter 5 represents a first step and the theoretical framework is potentially a good basis for further research.

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